

NO. 43

\$2.50

DECEMBER 1981

# MICRO<sup>TM</sup>

THE 6502/6809 JOURNAL



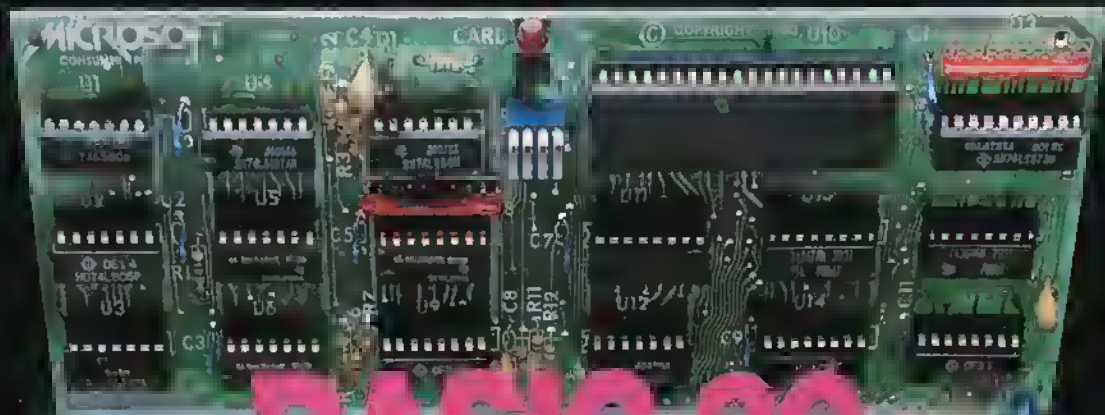
**Applesoft Feature**

Pascal Tutorial, Part 2

OSI Symbolic Disassembler

PET "Listener"

Atari Joysticks



**BASIC-80**  
**CP/M**  
**Z-80**



## Turn your Apple into the world's most versatile personal computer.

**The SoftCard™ Solution.** SoftCard turns your Apple into two computers. A Z-80 and a 6502. By adding a Z-80 microprocessor and CP/M to your Apple, SoftCard turns your Apple into a CP/M based machine. That means you can access the single largest body of microcomputer software in existence. Two computers in one. And, the advantages of both.

**Plug and go.** The SoftCard system starts with a Z-80 based circuit card. Just plug it into any slot (except 0) of your Apple. No modifications required. SoftCard supports most of your Apple peripherals, and, in 6502-mode, your Apple is still your Apple.

**CP/M for your Apple.** You get CP/M on disk with the SoftCard package. It's a powerful and simple-to-use operating system. It supports more software than any other microcomputer operating system. And that's the key to the versatility of the SoftCard/Apple.

**BASIC included.** A powerful tool, BASIC-80 is included in the SoftCard package. Running under CP/M, ANSI Standard BASIC-80 is the most powerful microcomputer BASIC available. It includes extensive disk I/O statements, error trapping, integer variables, 16-digit precision, extensive EDIT commands and string functions, high and low-res Apple graphics, PRINT USING, CHAIN and COM-MON, plus many additional commands. And, it's a BASIC you can compile with Microsoft's BASIC Compiler.

**More languages.** With SoftCard and CP/M, you can add Microsoft's ANSI Standard COBOL, and FORTRAN, or

Basic Compiler and Assembly Language Development System. All, more powerful tools for your Apple.

**Seeing is believing.** See the SoftCard in operation at your Microsoft or Apple dealer. We think you'll agree that the SoftCard turns your Apple into the world's most versatile personal computer.

**Complete information?** It's at your dealer's now. Or, we'll send it to you and include a dealer list. Write us. Call us.

SoftCard is a trademark of Microsoft. Apple II and Apple II Plus are registered trademarks of Apple Computer. Z-80 is a registered trademark of Zilog, Inc. CP/M is a registered trademark of Digital Research, Inc.

# MICROSOFT

CONSUMER PRODUCTS

Microsoft Consumer Products, 400 108th Ave. N.E.,  
Bellevue, WA 98004. (206) 454-1315



# ADVENTURE has gone GOLD! AND WE WANT YOU TO CELEBRATE WITH US.\*

The 12 Scott Adams' Adventures are presented in our **Limited Gold Edition**. Each tape and disk is individually numbered, and guaranteed until July 10th, 2001. Each package contains a certificate of authenticity, a registration card and an autographed, (rather interesting) photo of the author. The 12 Adventures normally retail for \$239.40 individually on tape and \$159.80 for 4 triple-pack disks.

The **Limited Gold Edition** is yours ... forever ... for \$100.00 tape or disk, value for value. To Order: The **Limited Gold Edition** is available in very limited quantity, from interested Software Retailers. Ask your local dealer. If he does not have The **Limited Gold Edition** ... Then call toll free 1-800-421-5770. In California 1-800-262-4242 (Local 213-670-9461) ... And we will direct you to a dealer who does have the **Limited Gold Edition**. **Supply is Limited!**

The **Limited Gold Edition** is available in the following different configurations.

- Apple 2 Disk with TRS-80 Disk in same package
- Atari Tape
- Atari Disk
- TRS-80 Tape

\$100.00 Each



\*In keeping with the spirit of Adventure, \$1,000.00 in Gold Coins is hidden within The **Limited Gold Edition**. Its waiting for you.

The **Limited Gold Edition** from Adventure International is distributed exclusively by:

**SOFTSEL**

8295 SO. LA CIENEGA BLVD. • INGLEWOOD, CA 90301

# Wizard-80™

## INSTANT 80 COLUMN APPLE\*

The miracle of the 80's... everything you want in an 80-column card.

### STOP STARING AT 40 COLUMNS

WIZARD-80 lets you see exactly what you will get when typing 80-column format. It gives you a full 80-column by 24-line display with all these features.

- Fully compatible with Apple II® and Apple II Plus\*
- Fully compatible with most word processors, micro-modems and prom programmers, plus all current Apple II expansion boards
- Lists BASIC programs, integer and Applesoft
- Fully compatible with Pascal
- Uses software to switch between 40 and 80 column formats
- Displays 7X9 matrix characters
- Provides upper/lower case characters with full descenders
- Fully edits... uses ESCape key for cursor movement
- Scrolling stop/start uses standard Control-S entry
- Retains text on screen while it is being printed
- Contains crystal clock for flicker-free character display
- Has low power consumption for cool reliable operation
- Components soldered directly to the board for maximum reliability
- 2K on-board RAM, 50 or 60 Hz operation
- Inverse video select on standard

#### WIZARD-80

#### YOUR INSTANT 80-COLUMN APPLE

It is the Miracle of the 80's. It has STOP STARING AT 40 COLUMNS. The WIZARD lets you see exactly what you will get when typing 80-column format. It gives you a full 80-column by 24-line display with all these features: Fully compatible with most word processors, micro-modems and prom programmers, plus all current Apple II expansion boards. Fully compatible with Pascal. Uses software to switch between 40 and 80 column formats. Displays 7X9 matrix characters with full descenders. Fully edits, uses stop/start uses standard Control-S entry. Retains text on screen while it is being printed. Contains crystal clock for flicker-free character display. Low power consumption for cool reliable operation. Components soldered directly to the board for maximum reliability. 2K on-board RAM, 50 or 60 Hz operation. Interface for a light pen. Inverse video select on standard. The WIZARD-80 is available at all Fine Computer Stores.

Everything you want in an 80-column card. Lets you see exactly what you will get when typing 80-column format. It gives you a full 80-column by 24-line display with Apple II and Apple II Plus. Fully compatible with most word processors, micro-modems, prom programmers, plus all current Apple II expansion boards. Fully compatible with Pascal. Uses software to switch between 40 and 80 column formats. Displays 7X9 matrix characters with full descenders. Fully edits, uses stop/start uses standard Control-S entry. Retains text on screen while it is being printed. Contains crystal clock for flicker-free character display. Low power consumption for cool reliable operation. Components soldered directly to the board for maximum reliability. 2K on-board RAM, 50 or 60 Hz operation. Interface for a light pen. Inverse video select on standard. The WIZARD-80 is available at all Fine Computer Stores.

It comes to you from  
Wesper Micro Systems  
a subsidiary of  
WESPERCORP

AVAILABLE AT ALL FINE  
COMPUTER STORES

➔➔ **WESPER Micro  
Systems**

SUBSIDIARY OF WESPERCORP

14321 New Myford Road  
Tustin, California 92680

# MICRO™

THE 6502/6809 JOURNAL

## STAFF

Editor/Publisher  
ROBERT M. TRIPP

Associate Publisher  
MARY GRACE SMITH

Associate Editors  
MARY ANN CURTIS  
FORD CAVALLARI

Special Projects Editor  
MARJORIE MORSE

Production Coordinator  
PAULA M. KRAMER

Typesetting  
EMMALYN H. BENTLEY

Advertising Manager  
CATHI BLAND

Circulation Manager  
CAROL A. STARK

Dealer Orders  
LINDA HENSDELL

MICRO Specialists  
APPLE: FORD CAVALLARI  
PET: LOREN WRIGHT  
OSI: PAUL GEFFEN

Comptroller  
DONNA M. TRIPP

Bookkeeper  
KAY COLLINS

Advertising  
Sales Representative  
KEVIN B. RUSHALCO  
603/547-2970

## DEPARTMENTS

- 5 Editorial
- 6 New Publications
- 31 Letterbox
- 35 PET Vet
- 38 Microbes and Updates
- 43 From Here to Atari
- 79 Short Subjects
- 112 Software Catalog
- 117 Hardware Catalog
- 119 6502 Bibliography
- 127 Advertiser's Index
- 128 Next Month in MICRO

## HARDWARE

- 9 Data Collection with Your Micro.....*John C. Traeger*  
Interface allows high-speed sampling and recording
- 14 PET "Listener".....*Louis F. Sander and Victor H. Pitre*  
Listen to your PET tapes and have a CB2 sound amplifier
- 21 Watch that Ground Connection.....*Raymond Weisling*  
Protect your computer with a properly connected ground
- 27 Proportional Joystick for Atari.....*Mike Dougherty*  
Make your own joystick for five dollars

## PROGRAMMING AIDS

- 49 Some Help for KIM, Part 2.....*Wayne D. Smith*  
Investigation of the single step feature
- 53 OSI Symbolic Disassembler.....*David E. Pitts*  
Popular disassembler adapted for C4P

## PROGRAMMING LANGUAGE

- 57 Pascal Tutorial, Part 2.....*Victor R. Fricke*  
A look at the Apple Pascal Filer
- 64 Flags and Boolean Algebra in Microsoft BASICs... *M. Guzdial*  
Features to give you powerful program structures
- 68 Recursive Use of GOSUB in Microsoft BASIC... *R. B. Johannesen*  
Implementation for OSI, PET, Apple, TRS-80 Color and others

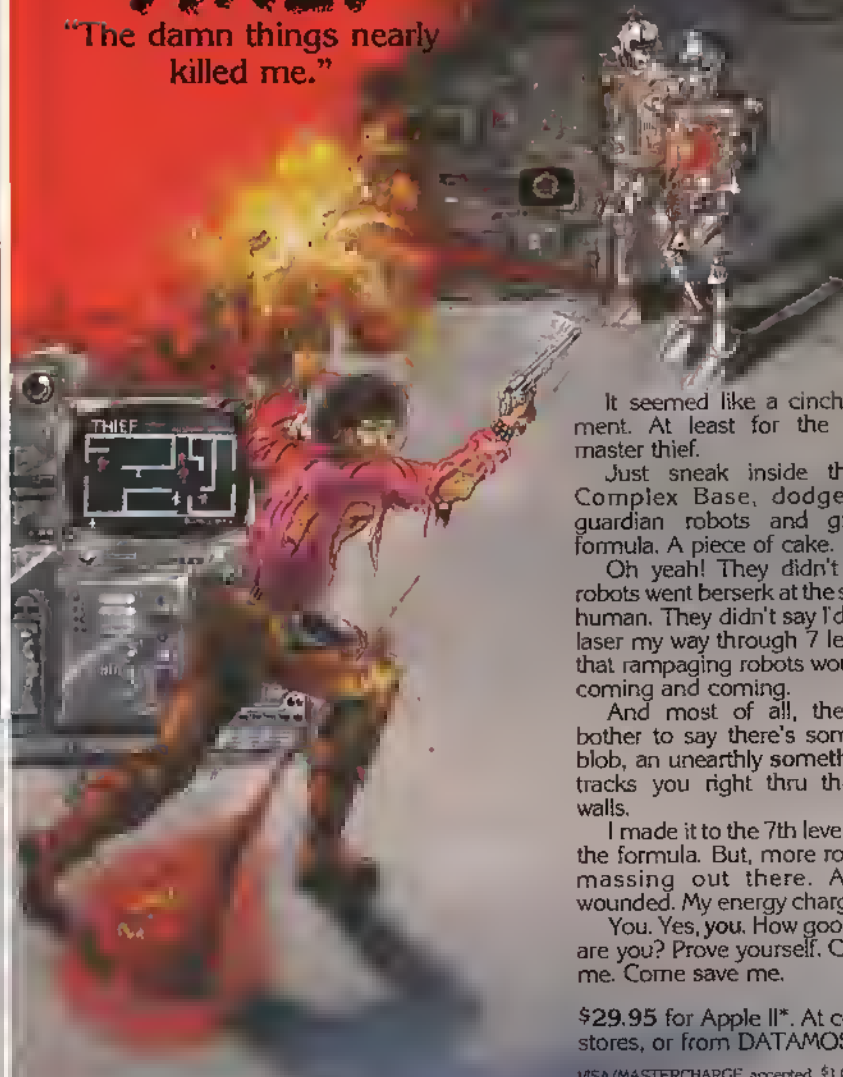
## APPLESOFT

- 85 Applesoft Variable Lister.....*Richard Albright*  
Use this lister with any program, anywhere in memory
- 96 Applesoft Memory Map Display.....*N.D. Greene*  
Create maps without altering memory contents
- 101 Applesoft Line Finder Routine.....*Peter J.G. Meyer*  
Display bytes of a particular line, use subroutines available in monitor
- 106 Applesoft and Matrices.....*Cornelis Bongers*  
Machine language program performs special matrix operations



# "THIEF"

"The damn things nearly killed me."



It seemed like a cinch assignment. At least for the galaxy's master thief.

Just sneak inside the Star-Complex Base, dodge a few guardian robots and grab the formula. A piece of cake.

Oh yeah! They didn't say the robots went berserk at the sight of a human. They didn't say I'd have to laser my way through 7 levels. Or, that rampaging robots would keep coming and coming.

And most of all, they didn't bother to say there's some weird blob, an unearthly something that tracks you right thru the damn walls.

I made it to the 7th level. I found the formula. But, more robots are massing out there. And I'm wounded. My energy charge is low.

You. Yes, you. How good a Thief are you? Prove yourself. Come get me. Come save me.

**\$29.95 for Apple II\*.** At computer stores, or from DATAMOST.

VISA/MASTERCARD accepted. \$1.00 shipping/handling charge. (CA residents add 6% tax)

\*Apple II is a trademark of Apple Computer, Inc.

**DATAMOST**

19273 Kenya St., Northridge, CA 91326, (213) 366-7160

## About the Cover



At first glance our cover looks "traditional" for this time of year. Actually, we have broken our own tradition of using a color photo and monochrome computer graphic overlay. This month's cover photo depicts winter in the Berkshire Mountains of Massachusetts.

The graphic overlay was created using a PET and the programmable character feature of the CBM 4022 printer. The colors were stripped in by Gilbert Color Labs of Hudson, New Hampshire.

(Cover Photo by John Rodriguez)

**MICRO** is published monthly by:  
MICRO INK, Inc., Chelmsford, MA 01824  
Second Class postage paid at:  
Chelmsford, MA 01824 and Avon, MA  
02322  
USPS Publication Number: 483470  
ISSN: 0271-9002

Send subscriptions, change of address, USPS  
Form 3579, requests for back issues and all  
other fulfillment questions to

MICRO  
34 Chelmsford Street  
P.O. Box 6502  
Chelmsford, MA 01824  
or call  
617/256-5515  
Telex: 955329 TLX SRVC

Subscription rates	Per Year
U.S.	\$18.00
Foreign surface mail	\$21.00
Air mail:	
Europe	\$36.00
Mexico, Central America	\$39.00
Middle East, North Africa	\$42.00
South America, Central Africa	\$51.00
South Africa, Far East, Australasia	\$60.00

Copyright © 1981 by MICRO INK, Inc.  
All Rights Reserved

# MICRO

## Editorial

### New Product Review Policy

As you may be aware, MICRO has not published product reviews for several months. Previously, MICRO handled reviews with MICROScope. This system involved receiving a product, selecting a qualified reviewer, sending the reviewer the product, preparing the review, sending a copy to the manufacturer, and again contacting the reviewer. By the time the review finally appeared in the magazine, six months might have elapsed from our initial receipt of the product. This ended up being unsatisfactory for both the manufacturer and for the readers. Furthermore, many competitive products weren't covered, and we had trouble reviewing all the products received. As a result of the long delays and the inherent bias, we stopped publishing reviews altogether.

We do realize that both manufacturers and readers want reviews, even if they don't meet such high standards of impartiality as we had intended with MICROScope. As a result, we are changing and relaxing our review policy.

Reviews will be considerably shorter than MICROScopes tended to be (probably a half column) and will contain material that is primarily evaluative rather than descriptive in nature. (You can get the details by reading the manufacturer's promotional literature, advertisements, entries in our Hardware and Software Catalogs, or by listening to the salesman.) After you have that information, you need advice from a knowledgeable person on whether to buy the product. Our reviewers will tell you the answers to such vital questions as:

Does it work?  
Is it well documented?  
What won't it do?  
Is it "user-friendly"?  
Do I need a degree in computer science to use it?

We are still in the process of assembling our review panel, so it will be a few months before any reviews appear in the magazine. In the meantime, we think it is important to let both the

manufacturers and the readers know that we are not ignoring this very important area of service.

### Coming Changes

Next month, to start the year off right, we'll introduce some changes in MICRO.

A better quality of printing and more use of color within the magazine will be two obvious enhancements. Instead of the current binding where the pages are glued together (called "Perfect"), we will change back to the form with the staples (called "Saddle-stitch"). This makes it easier for the magazine to lie flat while you are entering a program. Also, the magazine will no longer have the holes for three-ring binders. We expect a few complaints about this, but the magazine has grown so in size that now it is difficult to collect more than four issues in a standard binder. Furthermore, hole punching is an extra step, which has several times significantly delayed our shipping.

MICRO will no longer be sent to subscribers in envelopes. Instead, the mailing label will be pasted directly onto the cover of the magazine. Stuffing envelopes, too, has delayed mailings, and we suspect that the post office may not have recognized the envelopes as magazines, denying them the high priority they deserve. (To increase durability, we are increasing the weight of the cover. At the same time we are decreasing the weight of the paper inside, so that the overall weight will not change significantly.)

We expect these changes will get your MICRO to you sooner in an even more useful form, while helping to keep costs as low as possible.

*Loren Wright*

# MICRO

## New Publications

Mike Rowe  
New Publications  
34 Chelmsford Street  
P.O. Box 6502  
Chelmsford, MA 01824

### Games

**PET Games and Recreations** by Mac Oglesby, Len Lindsay, and Dorothy Kunkin. Reston Publishing Company, Inc. (Reston, Virginia), 1981, vii, 245 pages, diagrams, drawings, listings, 7 x 9 inches, paperbound.  
ISBN: 0-8359-5530-3  
ISBN: 0-8359-5529-X (pbk.) \$12.95

This collection of games, designed to entertain and educate, is suitable for both beginning programmers and computer veterans. Each game is accompanied by a brief summary, including

instructions, background information, and level of strategy.

**CONTENTS:** *How To Use This Book for Fun and Learning*—The Games; The Game Write-ups; The Listings; BASIC for Beginners; Special Guest Lectures; Games Bibliography. *Plan-Ahead Games*—Qwert; Capture; Tic Tac Toe; Reverse; Watch-person; Square; Motie; Sinners; Brainbuster. *Games of Deductive Reasoning*—Stars; Buiton, Buiton; Hurtle; Marian Hunt; The Code Game; Dr. Factor. *Games of Chance*—In Between (Acce Deucey); Thrice Dice. *Language and Counting Skills Games*—How Many?; Crossword Puzzle (Puzzlebox, Puzzle Entry); Wordsearch—A Hunt for Hidden Words. *Recreations*—Bouncing Ball Track Ways; Hypername, Nameblinker, Namerunner; Happy Birthday; Starfill; Marblesat; Petsketch. *Special Guest Lectures. Games Bibliography.*

**Inside BASIC Games** by Richard Mateosian. Sybex Inc. (2344 Sixth St., Berkeley, California 94710). 1981, xx, 325 pages, illustrations, 7 x 9 inches, paperbound.

ISBN: 0-89588-055-5 \$14.95

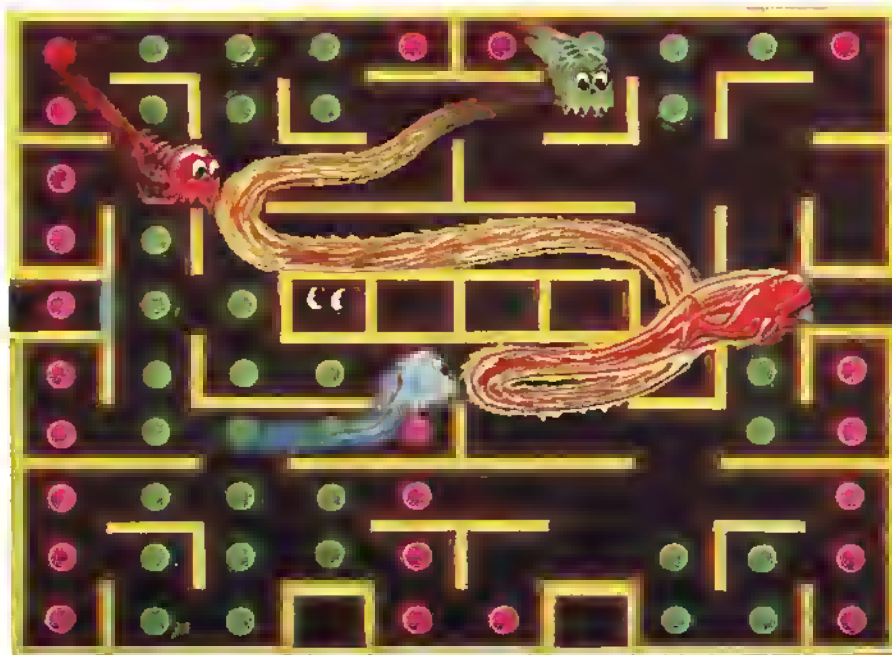
In this book, the author uses eight different kinds of computer games to teach

interactive programming in BASIC. The book is written for people interested in designing original games programs.

**CONTENTS:** *Arithmetic Games*—Addition Drill; The Addition Drill Program; Arithmetic Drill; The Arithmetic Drill Program; Possible Additions and Changes; Summary. *Guessing Games*—General Form of Guessing Games; Four; A Sample Game; The Guessing Game Program; The Hangman Program; Possible Additions and Changes; Summary. *Time Games*—The Pet Clock; Clock; The Clock Program; Card Memory; The Card Memory Program; Ten-Key Flicker; Timer; Summary. *Date Games*—Birthday; The Birthday Program; Calendar; The Calendar Program; Summary. *Taxman*—Instructions for Taxman; The Taxman Program; Suggestions for Improvements and Additions; Summary. *Programming with Free BASIC*—Program Design Techniques; Free BASIC; Translating from Free BASIC into BASIC; Free BASIC, Structured Programming and Pascal; Summary. *The Match-Up Game*—The Game-Building Phase; The Playing Phase; The Match-up Program; Changes and Improvements; Summary. *Craps*—Instructions for Craps; The Craps Program; Suggested Additions and Improvements; Summary. *Alien Life*—Alien Encounter; The Rules of Game of Life; The Alien Life Program; Improvements and Additions; Summary. *Appendix A. Index.*

MICRO

# SNACK ATTACK



Try one game and you're caught in its irresistible web of fun. More habit forming than peanuts. More fun than gorging on hot fudge sundaes. More exciting than anything like it.

SNACK ATTACK won't just a-maze you, it'll 3-maze you! Win the first level, and up pops a new, faster version, with a more intricate maze. And for more challenge there are doors you can enter and they can't. Doors they can dash thru and you can't.

SNACK ATTACK... by Dan Illowsky, the game that defies anyone to stop after just one game!

\$29.95, for Apple II\*  
At computer stores, or from:

**DATAMOST**  
19273 Kenya St.  
Northridge, CA 91326  
(213) 366-7160

\*Apple II is a trademark of Apple Computer, Inc.

VISA/MASTERCARD accepted. \$1.00 shipping/handling charge. (Calif. residents add 6% tax)



# DUAL RAM POWER RAMPLUS+

## From Mountain Computer

*Compatible with Apple® Language Card*

*16K RAM Provided*

*Additional 16K RAM Chips Available,  
utilized by user-generated software.*

*No Chip to Pull*

*No Cables to Attach*

*Works in our Expansion Chassis™*

*See your Apple® dealer or  
contact us for information.*



**Mountain Computer**  
INCORPORATED

300 El Pueblo

Scotts Valley, CA 95066

TWY: 910-598-4504

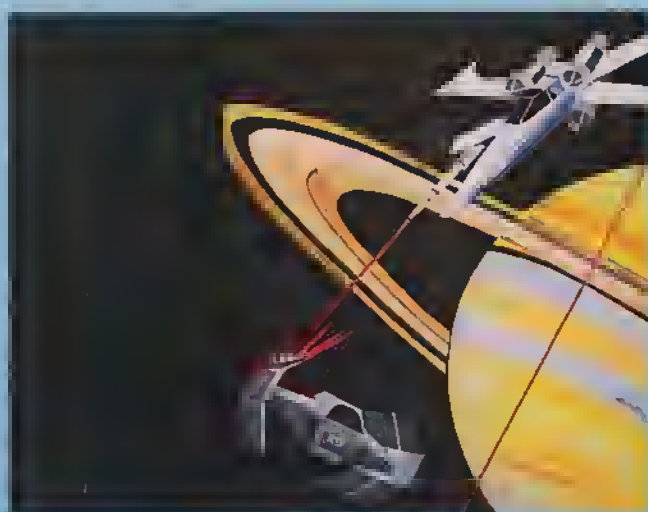
408-438-6650

Apple II is a trademark of Apple Computer, Inc.

ram'Photo—Animals Animals—Herp'nse—Party Stouffe—Collections

Mountain Photo—Avery

# NOW FROM SYNERGISTIC SOFTWARE



## ARCADE **NEW** GAME ESCAPE FROM ARCTURUS

A fast action dual mode high-res arcade style game with excellent color graphics and sound effects. In command of the Space Fortress you fend off powerful attackers from all sides. The attacking Griplems use several different ships, force fields and weapons in ever increasing numbers and speed. Once you take charge of the Arcturon ESCAPE ships you must battle a variety of invading Griplem landing craft. Control your ship with paddle or joystick while trying to ESCAPE into hyperspace. Provides more variety, challenge and choices than other arcade games.

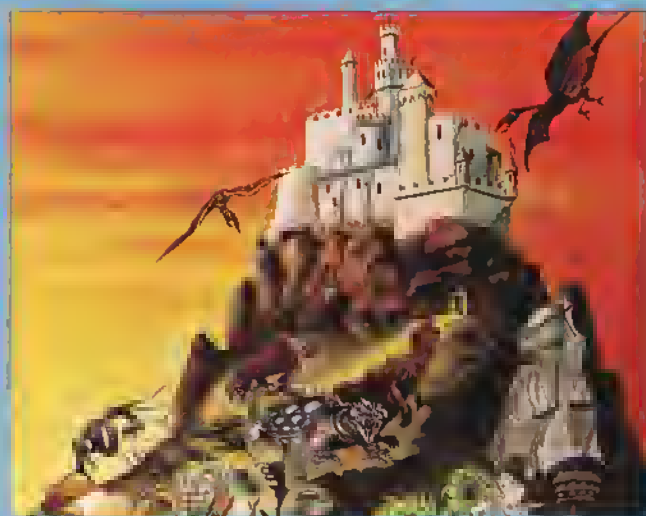
**Full Color - High Speed - Machine Language**  
Requires 48K, disk with DOS 3.3, Applesoft and paddles.  
**\$35.00**

## ADVENTURE **GAME**

### ODYSSEY: THE COMPLEAT ADVENTURE NOW AVAILABLE IN APPLESOFT or INTEGER

A mythic adventure game utilizing the Apple's colorful high-res graphics. The adventure is set in the Sargalo Sea, a haunted realm of sea serpents, dragons, and fabulous beasts. Many islands provide an endless variety of hazards and loes as you explore villages, castles, and dungeons. You walk, ride, sail and fly across detailed jungles, swamps, mountains and seas. At every step you decide the actions to be taken and your party's nature. You will collect magical devices, gather an army and set out on a quest to attack the powerful fortress on Lapour. Always challenging and uniquely different each time you play.

Requires 48K, disk with DOS 3.3, Applesoft or Integer.  
**\$30.00**



## EDUCATIONAL **NEW** SOFTWARE THE PLANETARY GUIDE

This colorful high-resolution handbook puts the solar system at your fingertips. The Planetary Guide is a new and exciting way to learn astronomy as you follow the program from the moon and sun, to the planets and their orbits, to comets and asteroids. All major solar system members are displayed in detail. Moon phases and planetary movement are animated on high-res screens. Pick your date and see the location of all planets in orbit as well as where each planet is listed in each constellation. Graphic displays along with text data and detailed tables provide as well as where each planet appears in each constellation. Keystroke commands allow rapid access to any of the general purpose or detailed programs.

**Great with The Star Gazer's Guide.**  
Requires 48K disk with DOS 3.3, Applesoft  
**\$30.00**



**Synergistic  
Software**

5221 120th Ave. S.E.  
Bellevue, WA 98006  
206-226-3216

All programs require Apple II or Apple II Plus. See your dealer for these and other fine Synergistic Software products or order directly.

Apple II and Applesoft are trademarks of Apple Computer, Inc.

# Data Collection with Your Micro

**This article describes how to construct and implement an interface which enables high-speed sampling and recording of experimental data. Written for an AIM 65, it is readily adapted to any 6502 microprocessor with either a 6520 or 6522 interface adapter.**

John C. Traeger  
Dept. of Physical Chemistry  
La Trobe University  
Bundoora, Victoria 3083  
Australia

One application for which the microprocessor is ideally suited is the rapid measurement of experimental data. This article describes how an AIM 65, with the aid of an inexpensive (less than \$50) and relatively simple interface, can be made to function as a high-speed recorder. The interface and operating program can be readily adapted for use on other 6502 systems.

The basic interface consists of a 10-bit analog-to-digital converter (ADC) which is connected to the AIM 65 via the user-dedicated 6522 Versatile Interface Adapter. To simplify design, an Analog Devices AD571 converter is used to digitize the signal voltage to a relative accuracy of 0.1%. This device is a successive approximation ADC consisting of a 10-bit digital-analog converter, voltage reference, clock, comparator, successive approximation register and output buffers all contained on a single chip. For less critical applications, a cheaper version with only 0.4% guaranteed accuracy (AD570) could be employed. Both converters have a typical conversion time of 25  $\mu$ sec.

## Digital Interface

The complete circuit for interfacing to the AIM 65 Application connector (J1) is shown in figure 1. Data transfer between the ADC and the microprocessor is via the two data ports of the 6522: PA0-PA7 and PB1-PB2 are used for the 10 data bits, with PB7 being used to monitor the DATA READY (end of conversion) status line of the AD571. The remaining unused bits of port B are held at logic 0 to reduce software overhead time.

Initiation of a conversion is triggered by a positive pulse on the BLANK and CONVERT line of the AD571. Because the pulse width must be greater than 2  $\mu$ sec, this is best accomplished under program control using the CA2 control line of the 6522 in the manual mode to generate a 6  $\mu$ sec-wide positive pulse. The two CB control lines can be used to synchronize the timing of the data acquisition with the signal to be measured.

## Analog Interface

The input voltage levels and polarities to the AD571 are determined by the bipolar offset control pin. A unipolar 0 to +10V range is obtained if this pin is shorted to digital common, and a bipolar  $\pm 5$ V range with offset binary output code results if the pin is left open. Because the AD571 has a relatively low input resistance (5 Kohms), it is necessary to buffer the analog input. Although the present circuit has achieved this by using an LM308 operational amplifier on the input in a voltage follower configuration, it is possible to include a variable gain option. The 15  $\Omega$  resistor in series with the analog input to the AD571 gives a typical full scale calibration error of  $\pm 0.2\%$ . For a more precise calibration it is necessary to replace this with a 50  $\Omega$  trimmer. In addition to the +5V supply

used for the AIM 65, a  $\pm 15$ V power supply is required for operation of the LM308 and AD571. (A  $\pm 12$ V supply could be satisfactorily used.) To minimize the effects of noise and interference, each power-supply line is bypassed to ground right at the converter with a 4.7  $\mu$ F tantalum capacitor.

The maximum signal frequency that can be handled with less than 1 least significant bit (LSB) error due to timing is given by

$$f_{\max} = 2^{-n/2} \pi T_c$$

where  $n$  is the number of bits and  $T_c$  is the conversion time. Thus, for the AD571 connected as shown in figure 1, it is only possible to measure signals with frequencies of 6 Hz or less to an accuracy of 0.1%. An increase in the frequency response can only be achieved at the expense of overall accuracy. The reason for this poor frequency response is that the input voltage to a successive approximation ADC must remain constant to within 1 LSB during the conversion process (25  $\mu$ sec for the AD571).

It is possible to greatly increase the frequency response by incorporating a sample and hold amplifier (SHA) in place of the buffer amplifier. This enables a constant input to the ADC to be maintained during a conversion which represents the analog signal as of a certain precisely known time. The ultimate limitation on timing accuracy is the aperture jitter or uncertainty of the SHA.

When a SHA is used with an ADC, the timing uncertainty of the conversion process is reduced by the ratio of aperture jitter,  $T_A$ , to the conversion time [i.e.  $T_A$  replaces  $T_c$  in equation 1]. For example, if an Analog Devices AD528 SHA, which has an aperture uncertainty of 15 nsec, is used in conjunction with the AD571, the maximum frequency



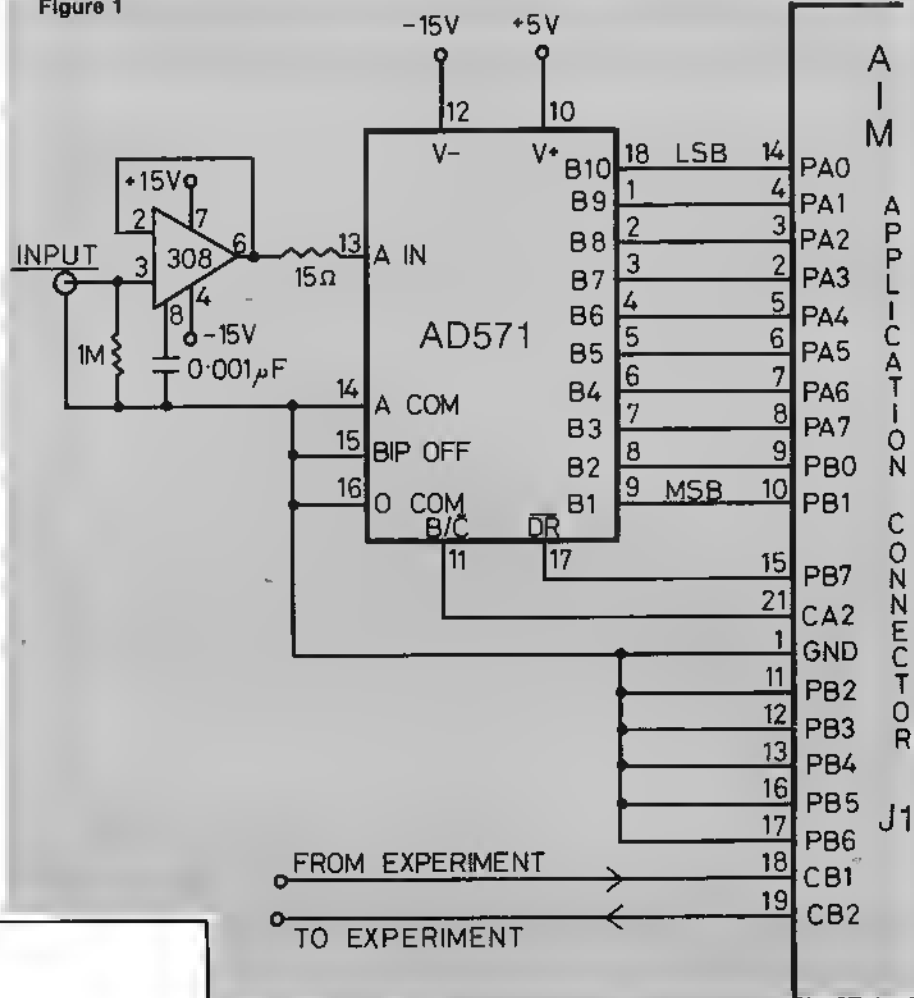
signal that can be digitized to 1LSB error is 10 kHz. However, in order to faithfully reproduce a signal, it is necessary to sample it at a rate which is at least twice the highest frequency. Thus, for a 10 kHz signal, the microcomputer must be capable of acquiring data in less than 50  $\mu$  sec. This is about the limit at which 10-bit data can be collected with a 1MHz 6502 microprocessor.

Many natural phenomena have an exponential, rather than an oscillatory, nature. For example, the discharging of a capacitor, various chemical reactions, and the decay of radioactive isotopes all follow an exponential relationship. These processes are characterized by a particular parameter called the half-life, which is the time taken for the initial quantity to be reduced by 50%. The fastest exponential decay that can be followed digitally with less than 1LSB error is given by

$$T_{1/2 \text{ min}} = 0.6931 T_c 2^n$$

where  $n$  is the number of bits of precision and  $T_c$  is the conversion time of the ADC (or the aperture uncertainty if a SHA is used on the input). The AD571 as shown in figure 1 is capable of accurately following processes with a half-life of only 18 msec.

Figure 1



```

*****
*          *
*  DATAcq  *
*          *
* BY J.C. TRAEGER *
*          *
*****
;
; COLLECTS DATA FROM AN AD571 ANALOG-TO-
; DIGITAL CONVERTER INTERFACED TO AN AIM 65
; VIA THE USER 6522 VIA. ALL DATA IS
; STORED IN MEMORY FOR SUBSEQUENT PROCESSING
; BY THE BASIC PROGRAM. THE TIME INTERVAL
; BETWEEN SUCCESSIVE POINTS IN UNITS OF
; 0.01 SEC. IS PASSED TO THE PROGRAM VIA
; THE USR ARGUMENT AS AN INTEGER BETWEEN 1 AND 255
;
CTR     EPZ $A9           ;COUNTER FOR NO. OF 0.01 SEC INTERV.
BUFFLO  EPZ $AA           ;LOW ORDER BYTE OF ADC BUFFER
BUFFHI  EPZ $AB           ;HIGH ORDER BYTE OF ADC BUFFER
MSEC10  EPZ $AD           ;LOW ORDER BYTE OF USR ARGUMENT
NCONV   EPZ $AE           ;CONVERSION COUNT BUFFER
;
DATLO   EQU $0F80         ;START ADDR. FOR LOW BYTE OF DATA
DATHI   EQU $0A0A         ;START ADDR. FOR HIGH BYTE OF DATA
;
; 6522 REGISTER DEFINITIONS
;
IRB     EQU $A000         ;INPUT REGISTER B
IRA     EQU $A001         ;INPUT REGISTER A
TICL    EQU $A004         ;TIMER1 LOW ORDER COUNTER
TICH    EQU $A005         ;TIMER1 HIGH ORDER COUNTER
ACR     EQU $A00B         ;AUXILIARY CONTROL REGISTER
PCR     EQU $A00C         ;PERIPHERAL CONTROL REGISTER
IFR     EQU $A00D         ;INTERRUPT FLAG REGISTER
;
IFIX    EQU $BEFE         ;INTEGER CONV.--BASIS SUBR.
;
ORG $F00
OBJ $B00

```

## Software

The sample program shown here demonstrates the ability of the AIM 65 to follow fast reactions. For convenience, a minimum time interval of 10 msec. between data points has been chosen with a total of 50 points. It is a simple process to modify the program to accommodate more or less data points. The program enables reactions with a half-life between 0.1 sec. and 25 sec. to be satisfactorily followed.

Because of the speed with which data is collected, and for accurate control of the interval timing, the data acquisition section has been written as an assembly code subprogram (DATAcq). This places the data directly into memory for subsequent processing by the main BASIC program. The subprogram occupies less than 256 bytes, including data storage. The time interval, in units of 0.01 sec., is passed to DATAcq as an 8-bit integer (MSEC10). It is necessary to ensure that the USR argument is between 1 and 255 as no check is made within DATAcq. The page zero locations used by DATAcq

```

OFOO 20FEFE      ;
OFO3 A940      DATAQ JSR IFIX      ;GET THE USR ARGUMENT INTO $AD
OFO5 85AE      LDA #$40      ;SET UP FOR A MAXIMUM OF
OFO7 A5AD      STA NCONV      ; 64 CONVERSIONS/POINT
OFO9 C5AE      LDA MSEC10
OFOB B004      CMP NCONV      ;MORE THAN 0.63 SEC./POINT?
OFOD 6901      BCS START      ;YES, LEAVE NCONV=64
OF0F 85AE      ADC #$01      ;NO, SET NCONV TO MSEC10+1 TO
OF11            STA NCONV      ; ENSURE NO SLEWING ERROR
OF11            ;
OF11 A2DD      START LDX #SDD      ;GET READY TO START
OF13 A940      LDA #$40      ;SET TIMER T1 FOR
OF15 8DOBAC     STA ACR      ; CONTINUOUS OPERATION
OF18 A910      LDA #$10      ;LOAD T1CL
OF1A 8D04A0     STA T1CL
OF1D A927      LDA #$27      ;LOAD T1CH AND START THE
OF1F 8D05A0     STA T1CH      ; CLOCK AT 10 MSEC RATE
OF22            ;START THE EXPERIMENT USING CB2
OF22 8E0CA0     STX PCR      ;SET B/C AND CB2 LOW
OF25 A200      LDX #S00      ;INITIALIZE DATA ARRAY POINTER
OF27 A4AE      LDY NCONV      ;SET UP NO. OF ADC'S/POINT
OF29 A5AD      LDA MSEC10      ;GET NO. OF 0.01 SECS. AND
OF2B 85A9      STA CTR      ; SET UP LOOP COUNTER
OF2D A900      LDA #S00
OF2F 85AA      STA BUFFLO      ;CLEAR ADC BUFFER
OF31 85AB      STA BUFFHI
OF33 9D800F     STA DATLO,X      ; AND CURRENT DATA POINT
OF36 9D0ADA     STA DATHI,X
OF39 A9FF      LOOP2 LDA #$FF      ;RESET B/C AND CB2 HIGH
OF3B 8D0CA0     STA PCR
OF3E A9FD      LDA #$FD      ;B/C LOW STARTS CONVERSION
OF40 8D0CA0     STA PCR
OF43 18        CLC
OF44 A5AA      LDA BUFFLO      ;GET LOW BYTE OF ADC BUFFER
OF46 7D800F     ADC DATLO,X      ;AND ADD TO CURRENT DATA POINT
OF49 9D800F     STA DATLO,X
OF4C A5AB      LDA BUFFHI      ;GET HIGH BYTE OF ADC BUFFER
OF4E 7D0ADA     ADC DATHI,X      ; AND ADD TO CURRENT DATA POINT
OF51 9D0ADA     STA DATHI,X
OF54 AD00A0     WAIT LDA IRB      ;IS THE CONVERSION DONE?
OF57 30FB      BMI WAIT      ;NO, GO CHECK AGAIN
OF59 85AB      STA BUFFHI      ;YES, STORE HIGH BYTE IN BUFFER
OF5B AD01A0     LDA IRA      ;GET LOW ORDER BITS AND
OF5E 85AA      STA BUFFLO      ;STORE LOW BYTE IN BUFFER
OF60 88        DEY
OF61 10D6      BPL LOOP2      ;IF MORE READINGS, RESTART THE ADC.
OF63 E8        INX      ;NO, UPDATE DATA POINTER
OF64 2C0DA0     TWAIT BIT IFR      ;10 MSEC INTERVAL UP YET?
OF67 50FB      BVC TWAIT      ;NO, WAIT FOR TIMER FLAG
OF69 2C04A0     BIT T1CL      ;YES, CLEAR TIMER FLAG
OF6C C6A9      DEC CTR      ;END OF TIME ON THIS POINT?
OF6E D0F4      BNE TWAIT      ;NO, WAIT SOME MORE
OF70 E032      CPX #S32      ;YES, ALL 50 POINTS DONE?
OF72 D0B3      BNE LOOP1      ;NO, GET NEXT DATA POINT
OF74 60        RTS      ;YES, RETURN TO BASIC
END

```

are those of the floating point accumulator, and as such, have no effect on the operation of BASIC.

The number of analog-to-digital conversions at each point (NCONV) is a variable depending on the time interval. In order to avoid any slewing error, NCONV is set to MSEC10 + 1, up to a maximum of 64, which is the largest number of successive 10-bit conversions that can be added together (digital smoothing) without any overflow of the 16-bit data storage format. This arbitrary process ensures 10-bit accuracy for all exponential reactions which are followed to 99% completion. All data recording is done in the first 10 msecs. with each conversion and its associated processing taking less than 60  $\mu$  sec. To speed up throughput, part of the data processing is done during the AD571 conversion time so that it is necessary to perform a dummy conversion to obtain the final reading at each point.

**MICRO**

**BUY! SELL! TRADE**

COMPUTER & HAM EQUIPMENT

**COMPUTER®  
TRADER**

Mailed 1st class, 1st and 15th of every month  
SEND ADS FIVE DAYS BEFORE MAILING DATE

— RATES —

Subscriptions		Ads	
One Year	\$10.00	Hobby	20' Word/Number
Six Months	\$6.00	Business	55' Word/Number
Per Copy	\$1.00	(Non-Subscriber)	Add 15' Word/Number
Foreign (Air Mail)		\$25.00 yr.	

Send Ads and Subscriptions with remittance to.

**COMPUTER TRADER®**  
Chet Lambert, W4WDR  
1704 Sam Drive • Birmingham, AL 35235  
(205) 854-0271

For ads connl name and address, words and numbers  
(zip/area code free)

Please include your name, address, call sign or phone number

```

100 REM DEMONSTRATION PROGRAM FOR USE WITH SUBROUTINE DATAQ
110 DIM X(50)
120 INPUT "TIME/POINT IN UNITS OF 0.01S ";T
130 PRINT " "
140 IF T < 1 OR T > 255 THEN STOP
150 POKE 4,0: POKE 5,15
170 I = USR (T)
180 AL = 3968
190 REM START ADDRESS FOR LOW BYTE OF DATA ($OF80)
200 AH = 4032
210 REM START ADDRESS FOR HIGH BYTE OF DATA ($OF00)
220 FOR I = 1 TO 50
230 J = AL + I - 1
240 K = AH + I - 1
250 X(I) = PEEK (J) + PEEK (K) * 256
260 NEXT I
270 FOR I = 1 TO 50 STEP 2
280 PRINT X(I),X(I + 1)
290 NEXT I
300 PRINT " "
310 GOTO 120
320 END

```

# Lazer isn't afraid to compare!

(because we have the best lower case system available.)

Despite the fact that we were one of the first manufacturers to produce lower case equipment for the Apple II, Lazer MicroSystems products are still the state-of-the-art. Beside the obvious price/performance advantage we have over the competition, our products are expandable. Lazer is constantly introducing new products including our Lower Case + Plus II, Character Set + Plus (that adds 2 additional character sets to the Lower Case + Plus), and our new "Double Vision + Plus" for owners of Computer STOP's Double Vision 80-column board.

Lazer's products are compatible with more word processors than anybody else's. Our Lower Case + Plus is compatible with Easywriter and unmodified Apple writers. None of our competitors below can make that claim. In fact, BASIS' board isn't even compatible with Programma's PIE! The following chart lists Lazer's superiority over the competing units.

(LC+ = Lower Case + Plus LC+II = Lower Case + Plus II KB+ = Keyboard + Plus)

Feature	Paymar					LC+	LC+II	KB+/LC+II	KB+/LC+	KB+
	LCA-1	LCA-2	VIDEX	BASIS	VISTA					
True ASCII upper/lower case display	Y	Y	Y	Y	N	Y	Y	Y	Y	N
Inverse Lower Case	N	N	rev 7 only	N	—	Y	N	N	Y	—
Font Size	5 x 7	5 x 7	5 x 8	5 x 8	—	5x7, 7x8	5 x 7	5 x 7	5x7, 7x8	—
# of on-board character sets	1	1	1	1	—	up to 4 (2 std)	1	1	up to 4	—
Pseudo-descenders	Y	Y	N	N	—	Y	Y	Y	Y	—
True descenders	N	N	Y	Y	—	optional	N	N	optional	—
Optional fonts avail. (ROM, disk)	N	N	N	Y	—	Y	N	N	Y	—
2716-compatible character generator compatible with fonts created by HIRSH character generators	N	N	N	N	—	Y	N	N	Y	—
On-board graphics character set	N	N	N	N	—	Y	N	N	Y	—
Software provided on diskette	\$5 extra		N	N	—	Y	N	N	Y	Y
Single board works with all Apples	N	N	N	N	Y	Y	N	N	Y	Y
Expandable System	N	N	N	N	N	Y	Y	Y	Y	Y
Extensive user Documentation	N	N	Y	N	N	Y	Y	Y	Y	Y
High quality PC board	N	—	Y	Y	Y	Y	—	Y	Y	Y
Reset key disable	N	N	Y	Y	N	N	N	Y	Y	Y
Shift key mod	N	N	Y	Y	N	N	N	Y	Y	Y
All 128 characters available from keyboard	—	—	N	N	—	—	—	Y	Y	Y
Type ahead buffer	N	N	N	N	Y	N	N	Y	Y	Y
# of characters in buffer	—	—	—	—	40	—	—	64	64	64
Ability to clear or turn off buffer	—	—	—	—	N	—	—	Y	Y	Y
PRICE	59.95	49.95	129.95	125.00	49.95	64.95	29.95	129.90	164.90	99.95

Don't settle for anything less than the Lower Case + Plus, Lower Case + Plus II, or Keyboard + Plus. If your dealer doesn't stock our products give us a call, we'll try to connect you with a dealer in your area.

Before you buy a lower case system for the Apple II, call or write for our free booklet "Keyboard Enhances/Buffers and Lower Case Adapters: From The Inside Out." This booklet explains the advantages and disadvantages of using a lower case adapter in your Apple II.

Lazer products are carried by reputable dealers all across the world. If your dealer cannot provide you with a demonstration of our equipment and tries to sell you an inferior lower case adapter, give us a call, we'll give you the location of a dealer that can show you our equipment. Remember, an intelligent purchase cannot be made if you do not compare before buying.

State of the art performance, software compatibility, and exceptional value make Lazer's products the best there are!

Lower Case + Plus ..... \$64.95  
 Keyboard + Plus ..... \$99.95  
 Lower Case + Plus II ..... \$29.95  
 Character Set + Plus ..... \$24.95  
 Double Vision + Plus ..... \$39.95

Anix 1.0 ..... \$49.95  
 Lazer Pascal ..... \$39.95

Visicalc Users! Now you can have lower case on your Visicalc Screen, only from Lazer.

**Lazer**  
 MICRO-SYSTEMS INC.  
 1791-G Capital  
 Corona, CA 91720  
 (714) 735-1041





## JUDGE THE REST, THEN BUY THE BEST

Only GIMIX offers you **SOFTWARE SWITCHING** between **MICROWARE's OS-9** and **TSC's FLEX**. Plus you get the power of the **GMXBUG** system monitor with its advanced debugging utility, and memory manipulation routines. A wide variety of languages and other software is available for these two predominant 6809 Disk Operating Systems.

*You can order a system to meet your needs, or select from the 6809 Systems featured below.*

## JUDGE THE FEATURES AND QUALITY OF GIMIX 6809 SYSTEMS

**GIMIX' CLASSY CHASSIS™** is a heavyweight aluminum mainframe cabinet with back panel cutouts to conveniently connect your terminals, printers, drives, monitors, etc. A 3 position keyswitch lets you lock out the reset switch. The power supply features a ferro-resonant constant voltage transformer that supplies 8V at 30 amps, +15V at 5 amps, and -15V at 5 amps to insure against problems caused by adverse power input conditions. It supplies power for all the boards in a fully loaded system plus two 5 1/4" drives (yes! even a Winchester) that can be installed in the cabinet. The Mother board has fifteen 50 pin and eight 30 pin slots to give you the most room for expansion of any SS50 system available. 11 standard baud rates from 75 to 38.4K are provided and the I/O section has its own extended addressing to permit the maximum memory address space to be used. The 2 Mhz 6809 CPU card has both a time of day clock with battery back-up and a 6840 programmable timer. It also contains 1K RAM, 4 PROM/ROM/RAM sockets, and provides for an optional 9511A or 9512 Arithmetic Processor. The RAM boards use high speed, low power STATIC memory that is fully compatible with any DMA technique. STATIC RAM requires no refresh timing, no wait states or clock stretching, and allows fast, reliable operation. The system includes a 2 port RS232 serial interface and cables. All GIMIX boards use gold plated bus connectors and are fully socketed, GIMIX designs, manufactures, and tests in-house its complete line of products. All boards are twice tested, and burned in electrically to insure reliability and freedom from infant mortality of component parts. All systems are assembled and then retested as a system after being configured to your specific order.

### 56KB 2MHZ 6809 SYSTEMS WITH GMXBUG/FLEX/OS-9 SOFTWARE SELECTABLE

With #58 single density disk controller . . . . . **\$2988.59**

With #68 DMA double density disk controller . . . . . **\$3248.49**

to substitute Non-volatile CMOS RAM with battery back-up, add . . . . . 300.00

for 50 Hz export power supply models, add . . . . . 30.00

Either controller can be used with any combination of 5" and/or 8" drives, up to 4 drives total, have data recovery circuits (data separators), and are designed to fully meet the timing requirements of the controller I.C.s.

### 5 1/4" DRIVES INSTALLED IN THE ABOVE with all necessary cables

	SINGLE DENSITY		DOUBLE DENSITY		
	Formatted	Unformatted	Formatted	Unformatted	
40 track (48TPI) single sided	199,680	250,000	341,424	500,000	2 for \$790.00
40 track (48TPI) double sided	399,360	500,000	718,848	1,000,000	2 for 990.00
80 track (96TPI) single	404,480	500,000	728,064	1,000,000	2 for 990.00
80 track (96TPI) double	808,960	1,000,000	1,456,128	2,000,000	2 for 1300.00

Chart shows total capacity in Bytes for 2 drives.

Contact GIMIX for price and availability of 8" floppy disk drives and cabinets; and 5" and 8" Winchester hard disk system.

### 128KB 2Mhz 6809 DMA Systems for use with TSC's UNIFLEX or MICROWARE's OS-9 Level 2

(Software and drives not included) . . . . . **\$3798.39**

to substitute 128KB CMOS RAM with battery back-up, add . . . . . 600.00

for each additional 64KB NMOS STATIC RAM board, add . . . . . 639.67

for each additional 64KB CMOS STATIC RAM board, add . . . . . 988.64

for 50 Hz export power supply, add . . . . . 30.00

**NOTE: UNIFLEX can not be used with 5" minifloppy drives.**

GIMIX has a wide variety of RAM, ROM, Serial and Parallel I/O, Video, Graphics, and other SS50 bus cards that can be added now or in the future. Phone or write for more complete information and brochure.

## THE SUN NEVER SETS ON GIMIX USERS

GIMIX Systems are found on every continent, except Antarctica. (Any users there? If so, please contact GIMIX so we can change this.) A representative group of GIMIX users includes: **Government Research and Scientific Organizations** in Australia, Canada, U.K., and in the U.S.; NASA, Oak Ridge, White Plains, Fermilab, Argonne, Scripps, Sloan Kettering, Los Alamos National Labs, AURA. **Universities:** Carleton, Waterloo, Royal Military College, in Canada; Trier in Germany; and in the U.S.; Stanford, SUNY, Harvard, UCSD, Mississippi, Georgia Tech. **Industrial users** in Hong Kong, Malaysia, South Africa, Germany, Sweden, and in the U.S.; GTE, Becton Dickinson, American Hoechst, Monsanto, Allied, Honeywell, Perkin Elmer, Johnson Controls, Associated Press, Aydin, Newkirk Electric, Revere Sugar, HI-G/AMS Controls, Chevron. **Computer mainframe and peripheral manufacturers,** IBM, OKI, Computer Peripherals Inc., Qume, Floating Point Systems. **Software houses;** Microware, T.S.C., Lucidata, Norpak, Talbot, Stylo Systems, AAA, HHH, Frank Hogg Labs, Epstein Associates, Softwest, Dynasoft, Research Resources U.K., Microworks, Analog Systems, Computerized Business Systems.



GIMIX Systems are chosen by the Pros because of quality, reliability and features.

# GIMIX inc.

*The Company that delivers Quality Electronic products since 1975.*

1337 WEST 37th PLACE, CHICAGO, IL 60609  
(312) 927-5510 • TWX 910-221-4055

#### TO ORDER BY MAIL

SEND CHECK OR MONEY ORDER OR USE YOUR VISA OR MASTER CHARGE. Please allow 3 weeks for personal checks to clear. U.S. orders add \$5 handling if order is under \$200.00. Foreign orders add \$10 handling if order is under \$200.00.

Foreign orders over \$200.00 will be shipped via Emery Air Freight COLLECT, and we will charge no handling. All orders must be prepaid in U.S. funds. Please note that foreign checks have been taking about 8 weeks for collection so we would advise wiring money, or checks drawn on a bank account in the U.S.. Our bank is the Continental Illinois National Bank of Chicago, account #73-32033 Visa or Master Charge also accepted.

GIMIX INC. reserves the right to change pricing and product specifications at any time without further notice.

are registered trademarks of GIMIX Inc.

FLEX AND Uniflex are trademarks of Technical Systems Consultants Inc. OS-9 is a trademark of Microware Inc. See their ads for other GIMIX compatible software.

# PET "Listener"

**This article describes an easy-to-build device for listening to PET cassette tapes. In addition to detecting and correcting tape troubles, it doubles as a CB2 sound amplifier.**

Louis F. Sander  
and Victor H. Pitre  
153 Mayer Drive  
Pittsburgh, Pennsylvania 15237

Soon after acquiring my PET, I learned about CB2 sound, and bought a small Radio Shack amplifier-speaker to let me hear it. A bit of experimentation showed that the amplifier was also useful for listening to tape LOADs and SAVEs, and that listening to these processes would let me detect bad LOADs, attempts to SAVE without pressing RECORD, and misaligned heads. The amplifier quickly became my most useful PET accessory, and with it I was able to avoid tape problems of any kind, and have a lot of fun using sound in my programs.

But there were some drawbacks. For instance, my amplifier's volume was hard to keep at a comfortable level, and it used up a lot of batteries. More importantly, when I wanted to switch from CB2 to tape monitoring, I had to open up my PET and move the input lead from one place to another.

These problems were a nuisance, so a friend and I designed a simple circuit to overcome them. This article describes an easy-to-build gadget for listening to PET's CB2 sound, and for monitoring record and playback on either

tape drive. Output is adjustable from silence to a pleasingly loud level, and there are no batteries to replace. Input switching is automatic, and several inputs can be active at once without disrupting operation. The unit can be built in a few hours from common parts, at a total cost comparable to that of my original speaker-amplifier.

## Construction

The finished Listener is pictured in figure 1. I built mine on a small piece of perfboard, which I mounted to the automobile speaker control used for adjusting volume. The perfboard and its push-in terminals make construction easy, but there is nothing critical about this method, and the unit could be built on a scrap of wood, at a savings of

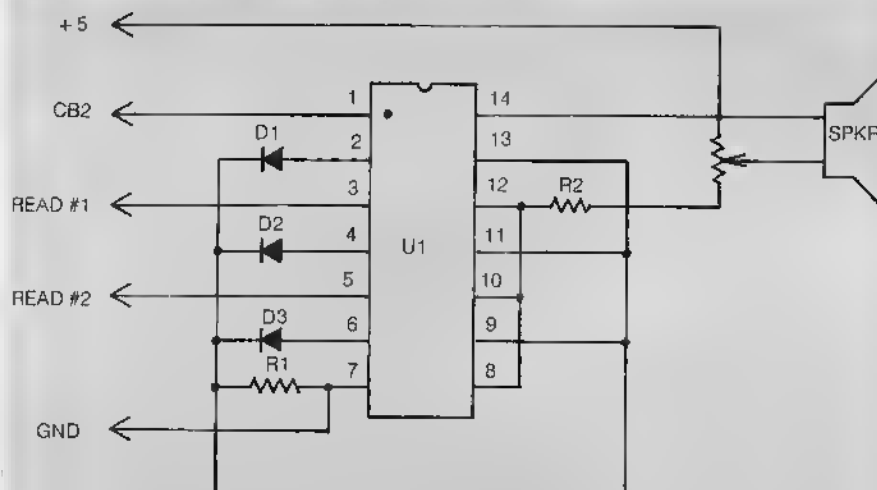
about half the total cost of parts. If you use my method of construction, mount the perfboard with flat head screws, and countersink them to give a flat bottom surface to your Listener.

Figure 2 is a schematic and wiring diagram, including a complete parts list. Just follow it as you build the Listener, and you can't go far wrong. You'll probably already have at least some of the hardware around the house. Construction is straightforward, if somewhat delicate; be careful about shorts and poor connections. Observe the proper polarity of the diodes — the end *without* the band is connected to the IC socket. Also, use pliers to protect the diodes when cutting or soldering their leads. Pin 1 of the 7404 is identified by an embossed dot, so be sure you plug it into pin 1 of the socket.



Figure 1: The Listener — a useful sound device for the PET.

**Figure 2: Listener Construction Diagram**



### Parts List

Symbol	Description	Radio Shack Part #
D1, D2, D3	1N914 Diodes	276-1122
R1	330 Ohm, 1/4 Watt Resistor	271-1315
R2	47 Ohm, 1/4 Watt Resistor	271-1307
R3	Auto Speaker Control (100 ohms)	40-550
SPKR	2 1/4" Round Replacement Speaker	40-246
U1	Type 7404 Hex Inverter IC	276-1802
	14-Pin DIP IC Socket	276-1999
	Pre-drilled Phenolic Board	276-1395
	Push-in Terminals	270-1392
	Hookup Wire	278-1307
	6-32 x 3/4" Machine Screws (2)	64-3012
	6-32 Nuts	64-3019
	6-32 x 1/4" Spacers	64-3024
	Double-sided Foam Tape Strips	64-2344

The push-in terminals make convenient tie points for input, output and power wires, but as mentioned before, they can be dispensed with. The long wires that come on the speaker control can be cut off and used to make other connections.

### Installation and Operation

The Listener requires several connections to your PET, and the TAPE #1 connector is a good place to make most of them. I stripped tiny places on the GND, +5 and READ wires coming from my built-in recorder, and soldered the appropriate wires there. The Listener's READ #1 wire goes to the tape player's READ wire, GND goes to either one of the two GND wires, and the +5 wire goes to the +5 wire. The identities of the tape unit wires are plainly marked on PET's circuit board.

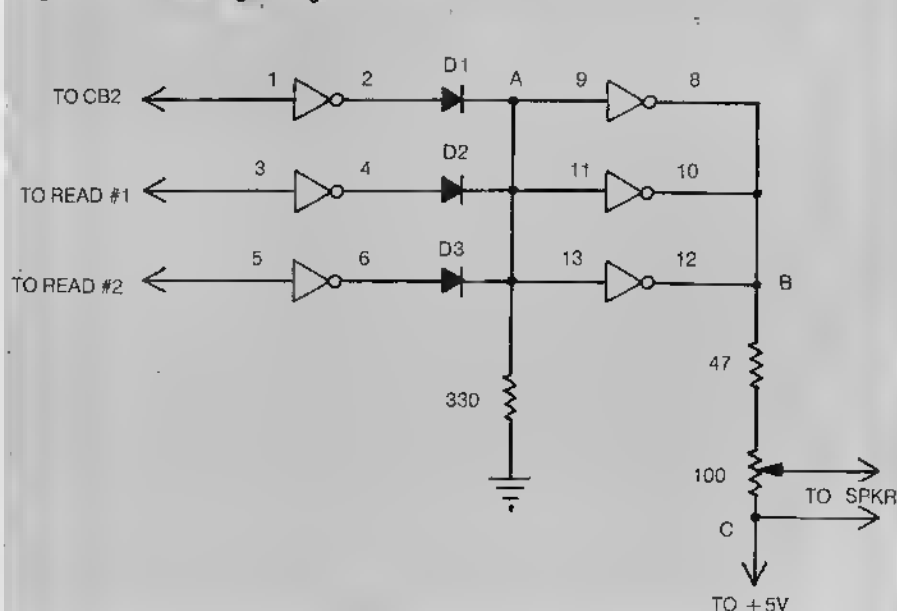
You could also make up a connector to go between the recorder and the PET, picking up these connections from it. Or you could carefully solder the wires to the proper points on the

PET circuit board. If you cringe at the thought of cutting or soldering inside your machine, just poke the stripped Listener wires into the back of the tape unit connector, and rely on the mechanical connections to pick up your voltages. The READ #2 wire from the Listener goes to the READ line of tape unit #2, and the CB2 wire goes to pin M of the Parallel User Port.

Use double-sided foam tape to mount your Listener and its speaker inside the PET. I drilled a hole (shudder!) in the left side of my PET to clear the Listener shaft and give me an external volume control. If you don't like drilling, just mount the control elsewhere.

The Listener should work as soon as you power up your PET. You should hear the output from either tape whenever the cassette unit is running, whether or not PET is reading the tape. This is handy in pre-positioning tapes, and for evaluating their quality without LOADING them. In my experience, bad tapes usually sound bad on the Listener. In my PET, I can also hear the tape while I'm SAVEing, but this is untested with the newer recorders. If I am trying to SAVE onto a blank tape and have forgotten to press RECORD, the absence of sound alerts me to that fact. But if the same thing happens with an already recorded tape, I hear

**Figure 3: Listener Logic Diagram**





# JINSAM™ 8.0

space  
age  
micro  
software

A black and white photograph of the Space Shuttle Columbia being launched from the Kennedy Space Center. The shuttle is ascending vertically, leaving a large, billowing plume of white smoke and fire at its base. To the left of the shuttle, the launch pad service structure is visible, a complex metal framework that supports the shuttle during liftoff. The sky is dark, and the overall scene conveys a sense of power and technological achievement.

Used at NASA,  
Kennedy Space Center  
With Multiple Applications Related  
to the Columbia Space Shuttle Project

DEALER INQUIRY WELCOME

## JINI MICRO-SYSTEMS, Inc.

DATABASE MANAGEMENT SYSTEM DESIGN

BOX 274 KINGSBRIDGE STN., RIVERDALE, N.Y. 10463 (212) 796-6200





BOX 120  
ALLAMUCHY, N.J. 07820  
201-362-6574

HUDSON DIGITAL ELECTRONICS INC.

## THE TASK\* MASTERS

HDE supports the \*TIM, AIM, SYM and KIM (TASK) with a growing line of computer programs and peripheral components. All HDE component boards are state-of-the-art 4½" x 6½", with on board regulation of all required voltages, fully compatible with the KIM-4 bus.

### OMNIDISK 65/8 and 65/5

Single and dual drive 8" and 5¼" disk systems. Complete, ready to plug in, bootstrap and run. Include HDE's proprietary operating system, FODS (File Oriented Disk System).

### DM816-M8A

An 8K static RAM board tested for a minimum of 100 hours and warranted for a full 6 months.

### DM816-U81

A prototyping card with on-board 5V regulator and address selection. You add the application.

### DM818-P8

A 4/8K EPROM card for 2708 or 2716 circuits. On board regulation of all required voltages. Supplied without EPROMS.

### DM816-CC15

A 15 position motherboard mounted in a 19" RETMA standard card cage, with power supply. KIM, AIM and SYM versions.

### DISK PROGRAM LIBRARY

Offers exchange of user contributed routines and programs for HDE Disk Systems. Contact Progressive Computer Software, Inc. for details.

### HDE DISK BASIC

A full range disk BASIC for KIM based systems. Includes PRINT USING, IF ... THEN ... ELSE. Sequential and random file access and much more. \$175.00

### HDE ADVANCED INTERACTIVE DISASSEMBLER (AID)

Two pass disassembler assigns labels and constructs source files for any object program. Saves multiple files to disk. TIM, AIM, SYM, KIM versions. \$95.00

### HDE ASSEMBLER

Advanced, two pass assembler with standard mnemonics. KIM, TIM, SYM and KIM cassette versions. \$75.00 (\$80.00 cassette)

### HDE TEXT OUTPUT PROCESSING SYSTEM (TOPS)

A comprehensive text processor with over 30 commands to format and output letters, documents, manuscripts. KIM, TIM and KIM cassette versions. \$135.00 (\$142.50 cassette)

### HDE DYNAMIC DEBUGGING TOOL (DDT)

Built in assembler/disassembler with program controlled single step and dynamic breakpoint entry/deletion. TIM, AIM, SYM, KIM AND KIM cassette versions. \$65.00 (\$68.50 cassette)

### HDE COMPREHENSIVE MEMORY TEST (CMT)

Eight separate diagnostic routines for both static and dynamic memory. TIM, AIM, SYM, KIM and KIM cassette versions. \$65.00 (\$68.50 cassette)

### AVAILABLE DIRECT OR FROM THESE FINE DEALERS:

Progressive Computer Software  
405 Corbin Road  
York, PA 17403  
(717) 845-4954

Johnson computers  
Box 523  
Medina, Ohio 44256  
(216) 725-4560

Lux Associates  
20 Sunland Drive  
Chico, CA 95926  
(916) 343-5033

Falk-Baker Associates  
382 Franklin Avenue  
Nutley, NJ 07110  
(201) 661-2430

Laboratory Microcomputer Consultants  
P.O. Box 84  
East Amherst, NY 14051  
(716) 689-7344

Perry Peripherals  
P.O. Box 924  
Miller Place, NY 11764  
(516) 744-6462

# WHY THE MICROSOFT RAMCARD™ MAKES OUR SOFTCARD™ AN EVEN BETTER IDEA.

Memory — you never seem to have quite enough of it.

But if you're one of the thousands of Apple owners using the SoftCard, there's an economical new way to expand your memory dramatically.

## 16K ON A PLUG-IN CARD.

Microsoft's new RAMCard simply plugs into your Apple II®, and adds 16k bytes of dependable, buffered read/write storage.

Together with the SoftCard, the RAMCard gives you a 56k CP/M® system that's big enough to take on all kinds of chores that would never fit before (until now, the only way to get this much memory was to have an Apple Language Card installed).

## GREAT SOFTWARE: YOURS, OURS, OR THEIRS.

With the RAMCard and SoftCard, you can tackle large-scale business and scientific computing with our COBOL and FORTRAN languages. Or greatly increase the capability of CP/M

applications like the Peachtree Software accounting systems. VisiCalc™ and other Apple software packages can take advantage of RAMCard too.

And RAMCard gives you the extra capacity to develop advanced programs of your own, using the SoftCard and CP/M. *Even with the RAMCard in place, you can still access your ROM BASIC and monitor routines.*

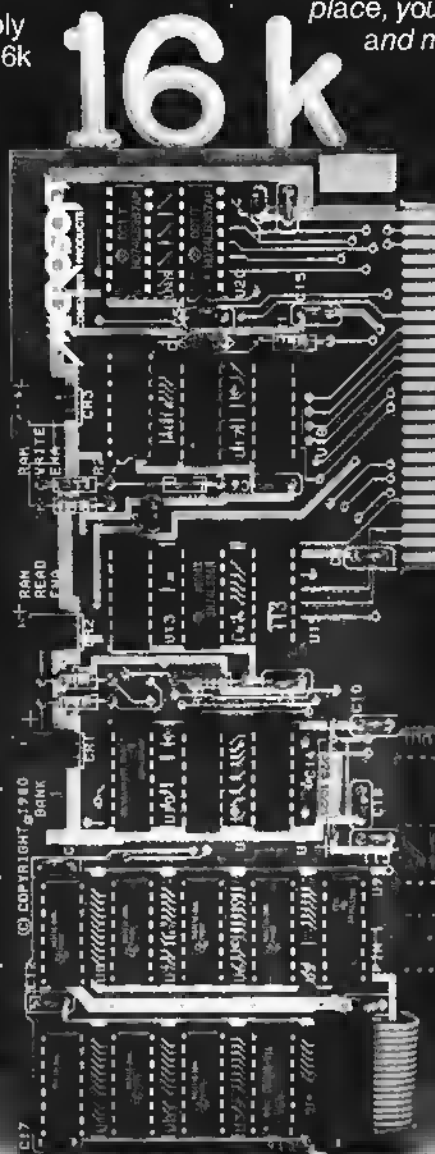
## JOIN THE SOFTCARD FAMILY.

The RAMCard is just the latest addition to the SoftCard family — a comprehensive system of hardware and software that can make your Apple more versatile and powerful than you ever imagined.

Your Microsoft dealer has all the exciting details. Visit him soon, and discover a great idea that keeps getting better.

Microsoft Consumer Products, 400 108th Ave. N.E., Suite 200, Bellevue, WA 98004. (206) 454-1315.

SoftCard, RAMCard and Microsoft are trademarks of Microsoft, Inc. Apple II is a registered trademark of Apple Computer, Inc. Z80 is a registered trademark of Zilog, Inc. CP/M is a registered trademark of Digital Research Inc. VisiCalc is a registered trademark of Personal Software, Inc. Microsoft Consumer Products is a division of Microsoft, Inc.



# MICROSOFT™





# Watch that Ground Connection

A properly connected ground is more than a precaution against shock — even the smallest oversights can lead to serious damage to your computer's components.

Raymond Weising  
Jalan Citropuran No. 23  
Surakarta, Jawa Tengah,  
Indonesia

As typical computer systems grow in size and complexity, with more and more pieces of equipment interconnected, there is a growing danger of damage to sensitive circuits from casual interconnect practices. Here we will look at some of these dangers, their causes, and what protective measures can be taken to insure safety to our expensive equipment. These dangerous practices are even more likely to strike the experimenter who uses less integrated systems; i.e., those systems which are built around smaller, less packaged devices such as the single board computer and its peripherals.

Exactly what dangers are we talking about? The source of most of the problems, or potential problems, is the mains power line that supplies the 115/230 volt AC power. For human safety, the United States (and other countries as well) has moved toward adopting a three-conductor plug-socket standard, where the third wire is an earth ground connection. The major idea here is that cases and frames of appliances can be assured of a good ground, in the event of an internal short to the case or frame, preventing a potentially fatal situation. Most of us

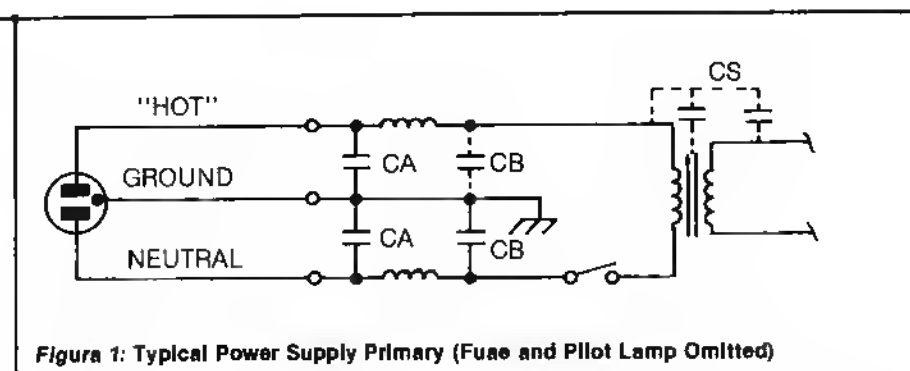


Figure 1: Typical Power Supply Primary (Fuse and Pilot Lamp Omitted)

are aware of this, but at the same time, most of us are also aware of widespread misuse of the intended safety feature. Many homes are not equipped with the newer sockets, and so the ground pin is defeated in some way. [The U.S. style plug is more easily abused in this way than some other styles in use in the world.] We go on using the equipment, which works just as well without this ground connection. Barring the rare case of a line-to-case short, there is no problem.

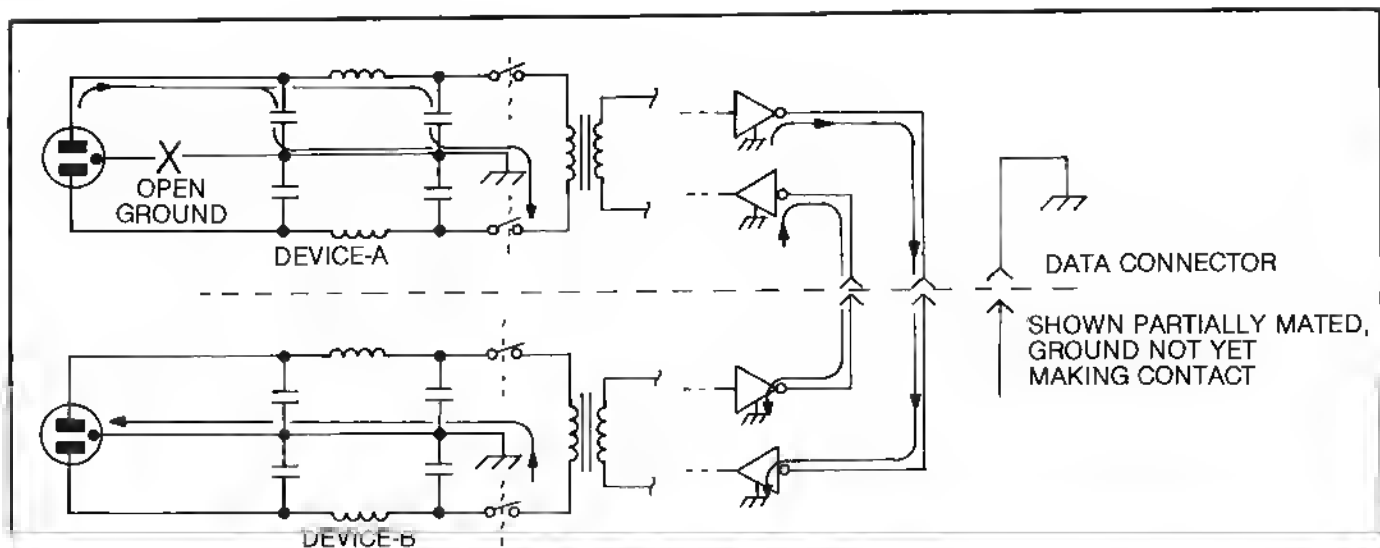
Or is there? Well, if the equipment in use is a computer-related device, serious damage can result due to misuse of ground connections. The same damage can even occur if there is such a ground connection, but where it has failed to make proper contact. [Worn sockets or broken wires inside the cable are typical causes.] Let us analyze the problem to understand how this can happen.

All of the computer devices, printers, disk systems, CRT's, etc., have power transformers, and many now employ line filters (see figure 1). The transformers usually have some capacitance between the primary and the iron core and the secondary. This represents a leakage path for the AC power. The use of a noise filter is guaranteed to offer a path for the AC line to the ground, or frame. Figure 2 shows some values of such capacitance and the possible current that can flow into the ground. Note that the noise filter configuration is a voltage divider for this AC flow, since the neutral line is usually well-connected (or else the equipment cannot operate), and thus the current available is half as great as in figure 2. But if the mains power is 230 volts, the current will be doubled.

If one of a group of devices has an open ground line, while the others are safely grounded, and if the data connector is inserted or removed, this cur-

Total Capacitance CA + CB + CS	Reactance At 60 Hz	Current In Ground At 115V
100 pf	25 M $\Omega$	4 $\mu$ A
1.0 nf	2.5 M $\Omega$	40 $\mu$ A
10 nf	250K $\Omega$	400 $\mu$ A
100 nf	25K $\Omega$	4 mA
1.0 $\mu$ f	2.5K $\Omega$	40 mA

Figure 2



**Figure 3: Death of a chip.** Arrows show current path from Device-A to Device-B, via I.C. devices, despite both power switches being "off."

rent can flow along an *unpredictable* path between the two pieces of equipment. While the items are connected, there is no problem, since the data ground path also carries the power line leakage current. But when the connectors are partly connected, as during insertion or withdrawal (or even an inadvertent withdrawal where no locking mechanism is in use), the data ground may not be connected while other data lines are connected. This is the kiss of death. [See figure 3.] The sensitive input circuits, or even the output drivers, may not take this abuse. Any on-chip protection diodes may not handle the current since they are small structures; off-chip protection diodes of more substantial size are not commonly employed, as they add cost and have large capacitances which degrade the risetimes of the data signals. And, since the density of ICs is increasing while the power dissipation is decreasing, the newer devices are more sensitive to such abusive voltage and current. An important thing to remember is that this danger does not disappear when the equipment is turned off, since the input line filters are usually located upstream of the mains switch. Further, if only a single pole switch is employed, there is a chance that the *hot* side of the line is still connected to the transformer and the capacitive-coupled path remains present.

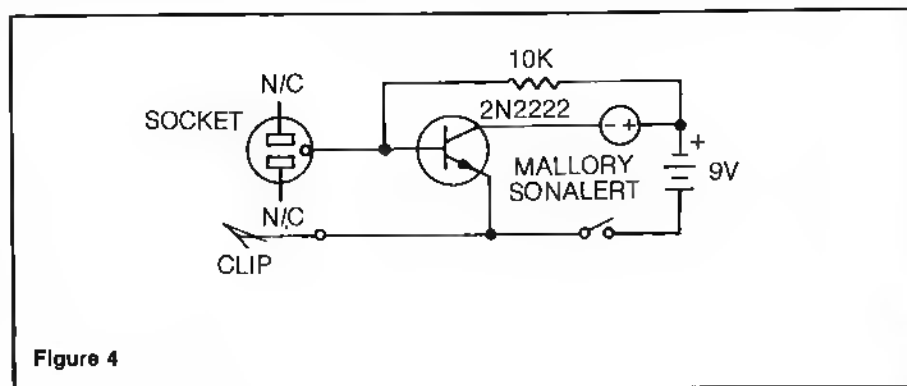
It might be appropriate to digress here on connector design and pin assignment, if only as a reminder to designers, in view of the dangers

described above. There are a few types of connectors in use where the intended ground pin is the first to make and the last to break during mating. The three-prong U.S. standard AC plug and the "Cannon XLR" audio connectors are two examples; both are equipped with this feature for different reasons. (The XLR connector used in professional audio systems can be mated even if on a "hot" microphone channel without any induced hum; the common "RCA Phono" plug used in consumer audio connections is quite the opposite, ensuring that the shield makes last.) Data connectors, on the other hand, never employ this strategy, and so whatever pin happens to make first is the one to carry any unwanted current. Equipment designers could offer a partial measure of safety by assigning the outermost pins on either side to ground. Then if the connector is accidentally partly tugged out of the socket by a taut cable, a ground on one

of the two sides still makes contact. However, for straight-in manual insertion, it is still a gamble as to what will happen.

We can ensure the safety of our expensive equipment through some preventive measures. One is to be sure all equipment has a good plug and cable connection for the ground or frame. Figure 4 illustrates a simple test set for this, intended to be built into a small case and employed periodically to insure that the cable is still good. [Plug in the mains cable and clip the wire to the frame, then flex the cable, especially near either end. If the path opens, the audio tone will come on.]

Another technique is to interconnect data cables only with the equipment unplugged fully. This can be a nuisance, but if you are using a power distribution strip with only one wall plug, it is much easier. If this strip has a



**Figure 4**

switch, it may be used if it breaks both sides of the line. (Check it with an ohmmeter.) Of course, be sure that the wall socket ground pin really is connected to a solid earth ground.

Finally, if an additional level of safety is desired, a separate ground wire can be connected to each piece of equipment, and then brought to a single common point.

### Case History

A few years ago I was programming on a minicomputer-based music synthesizer. The studio was too small for the Centronics 102A printer to be left permanently in place, so it was wheeled in each time a programming session took place. It was then connected to the computer interface wire-wrap panel and plugged into an empty wall socket. However, the whole computer system, synthesizer, 8-track tape deck, etc., was "floating" from an earth ground connection. (It is anybody's guess how much current was available from all the stray capacitances in parallel.) If the data connection was done first, there was no problem, but if the wall plug went in first, it was Russian Roulette at the data connector. Most of

the time we were lucky. The first time we lost, two TTL chips in the printer died but the cause was rather a mystery. The second time more chips died, and only then did the cause become apparent. After the system was grounded there were no more problems, but since many people used that studio, I was always especially careful to plug the printer into the wall last. When you've spent six or more hours troubleshooting slain chips, you become less casual about such things.

### Conclusion

Ground connections at the power socket, intended as an element of insurance against a rare, but potentially fatal (to people), short within equipment, are frequently abused or defeated for reasons of convenience. However, in the computer environment such bad practices can lead to equipment damage from AC power leakage current that comes, ironically, from other safety devices (noise filters) or from the power transformer itself. Careless or casual interconnection of equipment without consideration to this danger can cause mysterious component failure. Observing a few simple rules and ensuring that the hardware is in good condition will prevent these kinds of accidents.

MICRO

# 6809 Software

# WRITE OR CALL for CATALOG

(315) 474-7856  
Frank Hogg Laboratory, Inc.  
130 Midtown Plaza  
Syracuse, NY 13210

**Z-FORTH IN ROM** by Tom Zimmer  
5 to 10 times faster than Basic. Once you use it, you'll never go back to BASIC!  
source listing add

\$ 75.00  
\$ 20.00

**OSI FIG-FORTH** True fig FORTH model for OS65D with tig editor named files, string package & much more

\$ 45.00

**TINY PASCAL Operates** in tig-FORTH, an exceptional value when purchased with forth.  
TINY PASCAL & documentation  
FORTH & TINY PASCAL

\$ 45.00  
\$ 65.00

**SPACE INVADERS** 100% machine code for all systems with 64 chr. video. Full color & sound on C2, 4P & 8P systems. The fastest arcade program available.

\$ 14.95

### PROGRAMMABLE CHARACTER GENERATOR

Use OSI's graphics or make a complete set of your own! Easy to use, comes assembled & tested.  
2 Mhz. boards

\$ 99.95

\$109.95

### PROGRAMMABLE SOUND BOARD

Complete sound system featuring the AY-3-8910 sound chip. Bare boards available.

\$ 74.95

\$29.95

### 32/64 CHARACTER VIDEO MODIFICATION

Oldest and most popular video mod. True 32 chr, C1P, or 32/64 chr. C4P video display.  
Also adds many other options.

\$ 39.95

### ROMSIII

Augment Video Mod with our Roms, Full screen editing, print at selectable scroll, disk support and many more features. Basic 4 & Monitor

\$ 49.95

Basic 3

\$ 18.95

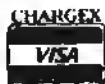
All 3 for

\$ 65.00

**65D DISASSEMBLY MANUAL.** by Software Consultants. First Class throughout.  
A must for any 65D user.

\$ 24.95

**NUMEROUS BASIC PROGRAMS, UTILITY PROGRAMS AND GAMES ALONG WITH HARDWARE PROJECTS. ALL PRICES ARE U S FUNDS. Send for our \$1.50 catalogue with free program (hardcopy) Memory Map and Auto Load Routine.**



**OSI Software & Hardware**  
3336 Avondale Court  
Windsor, Ontario, Canada N9E 1X6  
(519) 969-2500

3281 Countryside Circle  
Pontiac Township, Michigan 48057  
(313) 373-0468

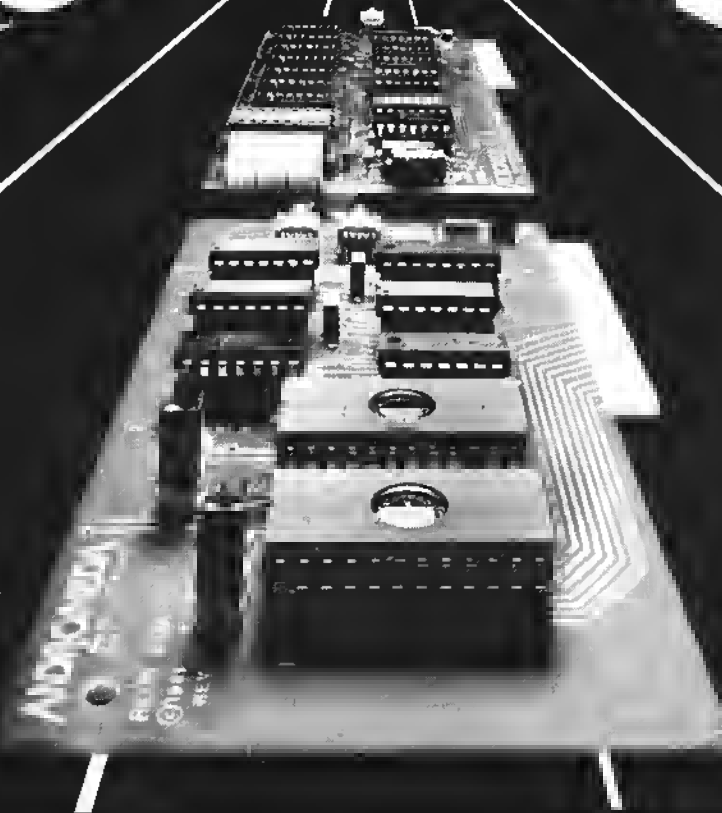


progressive computing



**A BRIGHT NEW STAR FROM  
ANDROMEDA!**

**ROM**  **RAM**



**NEW ROM BOARD FOR THE APPLE II\*  
\$125.00 WITH UTILITY ROM.**

With Andromeda's new ROM Board, you can plug many useful utility programs into your Apple II. Because ROM memory never forgets, you can access these utilities instantly without having to load them from disk.

The ROM Board comes with the utility ROM, which gives you five powerful options to apply to your Applesoft\* programs. With the Utility ROM, you can do automatic line numbering, control a program list with a page mode, restore a crashed Applesoft\* program in memory, alphabetize a disk catalogue and create a disk without DOS, giving you an extra 8K on your disk. Any of Soft Control Systems' other ROMS can be used, such as the Dual DOS in ROM, and Your'ple ROM.

You can install 2K PROMS, 4K PROMS, or even 2K RAM chips in each of the two memory sockets. So you can even have the Read - Write capability of RAM to develop PROM Programs yourself, or just have an extra 2K RAM for your machine - Language programs. Two 2732 PROMS allow a total of 8K of memory on the Board.

**Now with One Year Warranty.**

**ANDROMEDA**



**INCORPORATED**

Greensboro, NC. 27410  
P.O. Box 19144

919 852-1482



Price for Andromeda 16K RAM expansion board now only \$120.00. Please add \$5 for shipping and handling. North Carolina residents add 4% sales tax.

**\*DEALER INQUIRIES WELCOME.**

# MICRO

**BUSINESS WORLD INC.**  
Information Line (213) 996-2252  
TOLL FREE MAIL ORDER LINES  
(800) 423-5886 Outside Calif.

## COMPUTERS

	List	Our Price	SAVE
Apple II-16K	\$1330.00	\$999.00	\$331.00
Apple II-32K	1430.00		
Apple II-48K	1530.00		
Apple II 64K	1725.00		
Apple III 128-K	3915.00	2997.00	918.00

**ALTOS 8CS 8080-15** 3990.00 **4450.00** **1540.00**

**SHARP-64K 280 FULL KBD YX-3200** **CALL**

**HEC PC 8001** 1295.00 **1050.00** **245.00**

	List	Our Price	SAVE
<b>ATARI PERSONAL COMPUTERS</b>			
400 16K Bytes of Ram	595.00	337.45	257.55
800 16K Bytes of Ram	\$1080.00	739.00	341.00
410 Program Recorder	90.00	77.00	13.00
810 Disk Drive	600.00	457.00	143.00
625 Printer (80 col- Centronic 737)	999.95	769.00	230.95
820 Printer (40 col impact)	450.00	353.00	97.00
030 Acoustic Modem	200.00	155.00	45.00
850 Interface Module	220.00	192.00	28.00
Atari 400-16K	595.00	327.00	268.00

	List	Our Price	SAVE
<b>HP HEWLETT PACKARD</b>			
HP 125 Microcomputer	3750.00	2990.00	760.00
HP-85 Microcomputer	3250.00	2475.00	775.00
HP-43 Microcomputer	2250.00	1777.00	473.00
16K Exp-Memory Module	295.00	255.00	40.00
Graphics Plotter 7225	2450.00	2075.00	375.00
Personality Mod. for 7225	750.00	665.00	85.00
26318 Impact/printer hwy city	3950.00	3250.00	700.00
Option 020 for 26318	150.00	125.00	25.00
8 Drives to choose from			
829025	1300.00	1125.00	175.00
9895A 8" Dual Drive	6850.00	5500.00	1350.00
Graphics Tablet 9111A	2050.00	1670.00	374.00
HP-41 CV New 2.2 bytes mem	325.00	250.00	75.00
HP-41-C Calculator	250.00	105.00	145.00
Card Reader for 41CVC	215.00	162.00	53.00
Printer for 41CVC	385.00	289.00	96.00
Optical Wand for 41 CVC	125.00	97.00	28.00
Quad Ram equals 4 Mem. Mods	95.00	81.00	14.00
Memory Modules for 41C		25.00	\$
HP-97 Programmable Printer	750.00	595.00	155.00
HP-57 Programmable Calculator	375.00	295.00	80.00
HP-34C Programmable Scientific	150.00	117.00	33.00
HP-38C Programmable Bus. RE	150.00	117.00	33.00
HP-37E Business Mgmt.	75.00	57.00	18.00

We carry a large inventory of libraries, accessories and supplies.

## PRINTERS

	List	Our Price	SAVE
<b>EPSON</b>			
MX 80 FI	745.00	549.00	196.00
MX 80 IMPACT	645.00	450.00	195.00
MX 70 IMPACT	500.00	390.00	110.00
MX 100	995.00	765.00	230.00
<b>APPLE SILENTYPE</b>			
ANADEx 9501	645.00	299.00	346.00
<b>NEC</b>			
5510	3195.00	2445.00	750.00
5515	3295.00	2545.00	750.00
3510	2495.00	1795.00	700.00
3515	2545.00	1849.00	696.00
<b>OKIDATA</b>			
MICROLINE 80	545.00	395.00	150.00
MICROLINE 82	649.00	549.00	100.00
MICROLINE 83	1050.00	769.00	281.00
<b>PAPER TIGER</b>			
445G with Graphics	795.00	695.00	100.00
450G with Graphics	1,394.00	899.00	495.00
500G New full size	1,695.00	1,139.00	556.00
<b>DIABLO (LETTER QUALITY)</b>			
630 R102 bi-directional tractors	2,965.00	2,350.00	615.00
1640K109 keyboard tractors	4,000.00	2,899.00	1,100.00
630 R102 Receive Only	2,710.00	2,250.00	460.00
1650K 136 keyboard tractors	4,000.00	3,100.00	900.00

## SPECIAL OF THE MONTH

APPLE II PLUS  
48K W/16K  
EXPANSION BOARD



**Our price**  
**\$1199.00**

List price \$1780.00  
Our price \$1199.00  
**Save \$581.00**

## APPLE II STUDENT SYSTEM

- Apple II Plus System-48K RAM
- Disk II Floppy Disk & Interface (DOS 3.3)
- 12" Gm. Phs. Video Monitor

**SAVE \$655**  
Our Price **\$1795**

## MONITORS

	List	Our Price	SAVE
NEC Gm. Phs. 12"	\$285.00	239.99	\$45.00
BMC Green Phs. 12"	275.00	229.00	46.00
Zenith 12"	169.00	119.00	50.00

## SANYO MONITORS

	List	Our Price	SAVE
<b>High Resolution, Number 1 seller</b>			
13" Color (new) high quality	\$550.00	388.00	\$162.00
12" Green Phosphorus	360.00	240.00	120.00
15" Black & White	340.00	217.00	123.00
9" Black & White	370.00	235.00	135.00
The Best Seller!	235.00	145.00	90.00

## DISKETTES

	List	Our Price	SAVE
<b>SOLD IN BOXES OF 10 (Min. Purchase)</b>			
<b>BUY \$100 of the Following Diskettes</b>			
<b>OYSAN</b>			
104-1 5" SOFT SECTOR	\$ 6.00	3.99	2.01
104-10 5" DBL			
DEN SOFT SFC	6.40	4.60	1.80
3740-1 8" SOFT SECTOR	7.25	4.75	2.50
3740-10 8" DBL			
DEN SOFT SFC	10.75	6.90	3.85
<b>MAXELL</b>			
MD-1 5" SOFT SEC.			
TOR-DBL DEN	5.00	4.00	1.00
MD-2 5" SOFT SECTOR:DBL SIDE:DBL			
DEN	7.00	4.90	2.10
FD-1 8" SOFT SEC:IDBL			
DEN	6.50	4.50	2.00
FD-2 8" SOFT SEC:IDBL			
SIDE:DBL DEN	8.50	5.95	2.55

## TERMINALS

	List	Our Price	SAVE
<b>TELEVIDEO</b>			
910	699.00	599.00	100.00
912C	950.00	899.00	51.00
920C	995.00	795.00	200.00
950C	1,195.00	949.00	246.00

## DRIVES

	List	Our Price	SAVE
<b>CORVUS</b>			
5 MBYTES	3,750.00	3,050.00	700.00
10 MBYTES	5,350.00	4,449.00	901.00
20 MBYTES	6,450.00	6,450.00	1,125.00

**1 Year Extended WARRANTY**  
**\$99.00**  
**INQUIRE**

**AVINGS**  
**EVERY**  
**ELECTION**  
**ATTENTION**

**MICRO BUSINESS WORLD**  
**MAIL ORDER WAREHOUSE**  
18720 Oxnard, #108 Tarzana, CA 91356  
OUTSIDE CA CALL TOLL FREE 1 (800) 423-5886 IN CA (213) 996-2252

Name (Please Print) \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
C/O \_\_\_\_\_  
Make \_\_\_\_\_ Model \_\_\_\_\_ Description \_\_\_\_\_ Price \_\_\_\_\_  
CREDIT CARD \_\_\_\_\_  
Exp. Date \_\_\_\_\_ Signature \_\_\_\_\_

**30 DAY RETURN**  
TAX & APPLICABLE  
SHIPPING & HANDLING  
TOTAL (ENCLOSED \$)  
\*Call forms department 844-444-4444  
\*Add 3% for Shipping & Handling  
\*Add 2% surcharge for credit cards  
\*Orders outside of shipping unless accompanied by payment, including shipping & handling charges are not applicable

**Certified Check or M.O. Bank Wire Transfer**  
**Cash/Credit Card (Allow 2 weeks clearance for checks)**

# we beat the price...

## ATARI



800™ \$749

**ATARI**  
Computers  
for people.™

## ATARI 810 DISC DRIVE



\$444

### ATARI SOFTWARE

CX404 Word Processor...	\$119.00
CX405 PILOT...	\$68.00
CX413 MICROSOFT BASIC	\$68.00
CX4101 Invitation to Programming I	\$17.00
CX4102 Kingdom	\$13.00
CX4103 Statistics...	\$17.00
CX4104 Mailing List	\$17.00
CX4105 Blackjack	\$13.00
CX4106 Invitation to Programming 2	\$20.00
CX4107 Biohythm	\$13.00
CX4108 Hangman	\$13.00
CX4109 Graph II	\$17.00
CX4110 Touch Typing	\$20.00
CX4111 Space Invaders	\$17.00
CX4112 States & Capitals	\$13.00
CX4114 European Countries & Capitals	\$13.00
CX4115 Mortgage & Loan Analysis	\$13.00
CX4116 Personal Fitness Prog	\$59.00
CX4117 Invitation to Programming 3	\$20.00
CX4118 Conversational French	\$45.00
CX4119 Conversational German	\$45.00
CX4120 Conversational Spanish	\$45.00
CX4121 Energy Czar	\$13.00
CX4122 Chess	\$45.00

CX6001 U.S. History	\$23.00
CX6002 U.S. Government	\$23.00
CX6003 Supervisory Skills	\$23.00
CX6004 World History	\$23.00
CX6005 Basic Sociology	\$23.00
CX6006 Counseling Proceed	\$23.00
CX6007 Principal of Acl	\$23.00
CX6008 Physics	\$23.00
CX6009 Great Classics	\$23.00
CX6010 Business Comm	\$23.00
CX6011 Basic Psychology	\$23.00
CX6012 Effective Writing	\$23.00
CX6014 Principals of Econ	\$23.00
CX6015 Spelling	\$23.00
CX6016 Basic Electricity	\$23.00
CX6017 Basic Algebra	\$23.00
CX8106 Bond Analysis	\$20.00
CX8107 Stock Analysis	\$20.00
CX8108 Stock Charting	\$20.00
CXL4001 Education System Master	\$21.00
CXL4002 Basic Computing Language	\$46.00
CXL4003 Assembler Editor	\$46.00
CXL4004 Basketball	\$24.00
CXL4005 Video Easel	\$24.00
CXL4006 Super Breakout	\$30.00
CXL4007 Music Composer	\$45.00
CXL4008 Chess	\$30.00
CXL4009 3-D Tic Tac Toe	\$24.00

CXL4011 Star Raiders	\$39.00
CXL4012 Missile Command	\$32.00
CXL4013 Asteroids	\$32.00

CXL4015 TeleLink	\$20.00
Compuhome	\$74.95
Visicalc	\$149.00
Letter Perfect (Word Processor)	\$119.00
Source	\$89.00

### Atari® Peripherals:

400 16K	\$329.00
410 Recorder	\$59.00
822 Printer	\$359.00
825 Printer	\$ CALL
830 Modem	\$159.00
850 Interface	\$ CALL

### Atari® Accessories

New DOS 2 System	\$21.00
CX30 Paddle	\$64.00
CX30 Paddle	\$18.00
CX40 Joy Stick	\$18.00
CX853 16K RAM	\$89.00
Microtek 16K RAM	\$75.00
Microtek 32K RAM	\$ CALL



CBM 8032 \$1099



**commodore**



VIC 20  
\$259

4016	\$759.00
4032	\$999.99
8096	\$1795.00
CBM4022 Printer	\$629.00
Tally 8024	\$1699.00
CBM C2N Cassette Drive	\$69.00
CBM4040 Dual Disk Drive	\$999.00
CBM8050 Dual Disk Drive	\$1349.00

Vic-TV Modul	\$19.00
Vic Cassette	\$69.00
Vic Disk Drive	\$ CALL
Vic 6 Pack program	\$44.00

### CBM Software

WordPro3 Plus	\$199.00
WordPro4 Plus	\$299.00
Commodore Tax Package	\$399.00
Visicalc	\$149.00
BPI General Ledger	\$329.00
OZZ Information System	\$329.00
Dow Jones Portfolio	\$129.00
Pascal	\$239.00
Legal Time Accounting	\$449.00
World Ciali 80	\$289.00
Word Check	\$180.00
Create-A-Base	\$239.00
Power	\$89.00
Socket-2 Me	\$20.00
Jingam	\$ CALL

### Disks

CX8100 Blank Disk (5)	\$22.00
Sycorn Blank Disk (10)	\$29.00
Maxell Blank Disk (10)	\$36.00
Maxell Blank Disk (10)	\$46.00

### Printers

Call for prices on the new NEC models.	
Epson MX-70	
Epson MX-80	
Epson MX-80 F	Call for Prices
Diablo 630	
TEC 1500 Starwriter 25cps	\$1495.00
TEC 1500 Starwriter 45cps	\$1795.00

**No Risk, No Deposit On Phone Orders, COD or Credit Card, Shipped Same Day You Call \***

\* on all in stock units  
IN PA, CALL (717) 327-9575

**(800) 233-8950**

COMPUTER MAIL ORDER  
501 E. 3RD ST., WILLIAMSPORT, PA 17701

To Order:

Phone orders invited (800 number is for order desk only). Or send check or money order and receive free shipping. Pennsylvania residents add 6% sales tax. Add 3% for Visa or M.C. Equipment is subject to price change and availability without notice. Please call between 11 AM & 6 PM.

# Proportional Joystick for Atari

The Atari 800 comes equipped with eight specially designed A/D converters for use with the paddles. These A/D converters may be used to interface to an inexpensive \$5 proportional joystick from Radio Shack, allowing a much finer control for games and other applications.

Mike Dougherty  
7659 West Fremont Ave.  
Littleton, Colorado 80123

The normal Atari joystick is a very simple device — built to be rugged, yet inexpensive. The joystick consists of four open circuits in each of the up, down, right, and left directions. As the stick is

moved in any single direction, the appropriate circuit is closed. A diagonal move forms a combination of two adjacent closed circuits.

The joystick inputs are brought into the Atari through two 6520 PIA input ports, the values being placed in the appropriate shadow registers by the operating system. An open circuit appears as a logic 1 while a closed circuit appears as a logic 0. Thus, no contacts closed (the joystick not moved) is interpreted as a 15 (binary 0000 1111), DOWN is a 13 (binary 0000 1101), UP is a 14 (binary 0000 1110), RIGHT is a 7 (binary 0000 0111), and LEFT is an 11 (binary 0000 1011). This method of control reduces the angular resolution of the joystick direction to 45°. (0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315° are the only allowed angles.) In addition, there is no method to indicate "how much" — the joystick is either pulled in a specific direction or it is not.



Figure 1: Controller Jack Pin Assignment

This binary approach is similar to driving a vehicle that can only move at 55 mph or be parked — there is no way to "accelerate" or "slow down." To some degree, the problems created by this particular joystick design can be overcome by proper software.

A smooth operating joystick is available from Radio Shack, catalog #271-1705, for about \$5. This proportional joystick has a 100 K $\Omega$  linear potentiometer for both the X and Y directions. The total movement is  $30 \pm 3$  degrees in each direction. In other words, the resistance in the X and Y potentiometers is directly proportional to the X, Y position of the joystick with a range of nearly 0  $\Omega$  to 100 K $\Omega$ . This joystick, when mounted in a suitable case, has all the physical characteristics required of an operably smooth joystick.

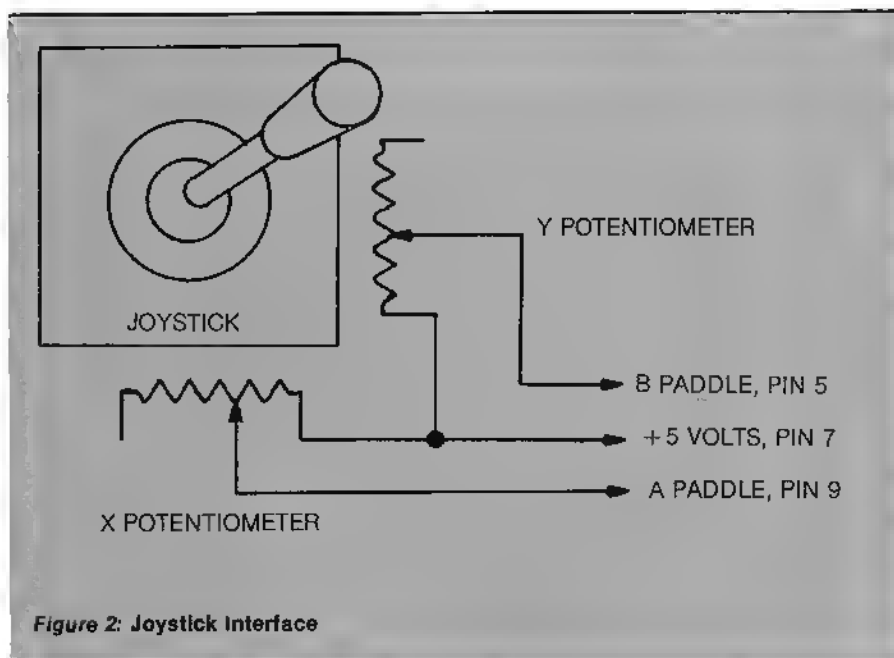


Figure 2: Joystick Interface



Fortunately, the problem of interfacing the joystick to the Atari 800 has already been solved. Each controller jack input contains the four normal Atari joystick inputs (closed/open circuits for each direction), the joystick trigger (also a closed/open circuit), two paddle inputs, a 5-volt source and a ground (see figure 1). Upon the examination of a paddle controller, this controller turned out to be nothing more than a 1 M $\Omega$  potentiometer. The paddle input circuit digitizes the resistance (voltage) at the A or B paddle input, while the operating system places this value in the paddle shadow registers each 1/60th of a second. The values sampled range from 1 (less than approximately 1200  $\Omega$ ) to 228 (greater than approximately 700 K $\Omega$ ). Thus, to digitize an external potentiometer value, the 5 volts of the controller jack should be applied to one of the two potentiometer inputs, and the potentiometer wiper output (middle connector) wired to either the A or B paddle input (depending on which PADDLE(n) is used by the software). For potentiometers with a range less than 1 M $\Omega$ , the digitized value will simply be less than 228.

The potentiometers in the Radio Shack joystick have a resistance range of 100 K $\Omega$ , giving an Atari paddle range of 1 to 42. For the purpose of a joystick, this is more than enough resolution. Listing 1 demonstrates a simple method to use the joystick to control a graphic dot on the screen. Figure 2 shows the details of the joystick interface. The joystick input is normalized in the program by a user-chosen value, 1 to 42, to reduce the step size taken each time in the main loop. Program 1 moves the dot proportional to the value of the joystick paddle inputs, allowing the user to accelerate and decelerate the dot as desired. The trace mode allows an elaborate version of an "Etch-a-sketch." This program demonstrates how the joystick input would be used to affect objects in an application program.

The Atari joystick is adjusted to return to the center position when not being used. However, the Radio Shack joystick has no such provision. One solution is to ignore the joystick input when the values drop below a certain threshold level. This solution creates a "dead" area around the center position, allowing for imperfect human

```

1 REM JOYSTICK BY
2 REM Mike Dougherty
3 REM
4 REM USING THE PADDLE A/D INPUT TO
5 REM IMPLIMENT AN INEXPENSIVE PRO-
6 REM PORTIONAL JOYSTICK.
7 REM
8 REM .....
9 REM
10 DIM ANSWER$(1)
20 GRAPHICS 0
60 POSITION 10,5:PRINT "Trace Mode (Y/N) ";:INPUT ANSWER$
70 POSITION 10,7:PRINT "Step scale (1-42) ";:INPUT SCALE
80 POSITION 10,9:PRINT "Threshold (0-42) ";:INPUT THRESH
100 REM
101 REM ..SET UP DRAWING FIELD
102 REM
110 GRAPHICS 8+16:REM HIGH RES
115 SETCOLOR 2,7,0:REM SET TO YOUR OWN FAVORITE COLOR
120 COLOR 1
130 X=160:Y=95:REM STARTING PLACE
140 A=0:REM X INPUT PADDLE CHANNEL
150 B=1:REM Y INPUT PADDLE CHANNEL
200 REM
201 REM ..MAIN LOOP:
202 REM ....SAMPLE THE PADDLES
203 REM ....IF CENTERED, GIVE AUDIO FEEDBACK
204 REM ....COMPUTE NEW POSITION AND ADJUST FOR SCREEN LIMITS
205 REM ....IF NOT TRACING, ERASE OLD POINT
206 REM ....PLOT NEW POSITION
207 REM ....IF A SPACE IS PRESSED, WAIT UNTIL ANOTHER KEY IS PRESSED
208 REM ..CONTINUE LOOP
209 REM
210 REM
211 REM ..INPUT JOYSTICK THRU PADDLES
212 REM
215 XDELTA=INT((PADDLE(A)-22)/SCALE)
220 YDELTA=INT((PADDLE(B)-22)/SCALE)
225 REM
226 REM
227 REM ..CHECK FOR EXTENDED JOYSTICK
228 REM .."DEAD" CENTER POSITION
229 REM
230 IF (ABS(XDELTA)<THRESH) AND (ABS(YDELTA)<THRESH) THEN XDELTA=0:YDELTA=0
235 REM
236 REM
237 REM ..AUDIO FEEDBACK FOR CENTER POSITION
238 REM
240 SOUND 0,0,0,0:IF (XDELTA=0) AND (YDELTA=0) THEN SOUND 0,120,10,2
245 REM
246 REM
247 REM ..NEW POSITION BASED UPON PROPORTIONAL
248 REM ..JOYSTICK VALUE -- KEEP ON SCREEN
249 REM
250 XNEW=X+XDELTA
260 YNEW=Y+YDELTA
270 IF XNEW<1 THEN XNEW=1
280 IF YNEW<1 THEN YNEW=1
290 IF XNEW>318 THEN XNEW=318
300 IF YNEW>188 THEN YNEW=188
305 REM
306 REM
307 REM ..ERASE OLD POINT IF NOT IN TRACE MODE
309 REM
310 COLOR 0
320 IF ANSWER$="N" THEN PLOT X,Y:PLOT X+1,Y+1:PLOT X-1,Y-1:PLOT X+1,
    ,Y+1:Y-1:PLOT X-1
325 REM
326 REM
327 REM ..PLOT CURRENT DOT POSITION
328 REM
330 COLOR 1
340 X=XNEW
350 Y=YNEW
360 PLOT X,Y:PLOT X+1,Y+1:PLOT X-1,Y-1:PLOT X+1,Y-1:PLOT X-1,Y+1
364 REM
365 REM
366 REM ..IF A SPACE IS PRESSED THEN
367 REM ..WAIT FOR ANOTHER KEY.
368 REM ..REPEAT LOOP
369 REM
370 IF PEEK(764)=33 THEN GOTO 370
380 GOTO 210

```

judgement. A second solution is to connect one of the joystick inputs through a momentary switch to the ground in the controller jack. The software could be written to use the joystick paddle values only when this specific switch is pressed (the circuit is closed and the corresponding bit is zero). Thus, when the dot has been moved to the proper position, simply let go of the momentary switch. These and other solutions each have strong points suited for specific applications.

As an expansion to this simple project, recall that the joystick inputs and the joystick trigger are simple open/closed circuits. Thus, with five momentary contact switches, the Radio Shack joystick, a suitable enclosure, and a nine-pin "D" connector, a high quality control system may be built to run from a single controller jack.

**MICRO**

#### KIM • SYM • AIM USERS

SALES

SUPPORT

#### HDE DISK SYSTEMS

NEW! ADC-B18-16 ANALOG-TO-DIGITAL CONVERTER WITH 16 CHANNEL ANALOG INPUTS!

- \*KIM-4 BUS COMPATIBLE
- \*8-BIT CONVERSION
- \*80 USEC CONVERSION
- \*BUILT ON 4-1/2 x 6 CARD
- \*MUX-OUT AVAILABLE FOR ANALOG SIG CONDITIONING
- \*BUY BUILT AND TESTED OR SAVE \$\$ AND BUY KIT
- \*COMPLETE W/MANUAL AND CIRCUITS
- ADC-B18-16 (BUILT & TESTED) ..... \$295.00
- ADC-B18-16KIT (KIT W/WIRE WRAP SOCKETS) ..... \$159.00
- ADC-B18-16KS (KIT W/SOLDER SOCKETS) ..... \$159.00

#### SOFTWARE FOR ALL FDS BASED SYSTEMS:

- MAIL MANAGER ..... PRICE \$49.95
- SOFTWARE FOR HDE BASIC:
- MINI-MONEY MANAGER ..... PRICE \$99.95
- MEMO-WRITER ..... PRICE \$49.95
- PAYROLL OFFICE ..... PRICE \$99.95
- TAX ADVISOR ..... PRICE \$79.95
- GLASS RECORD ..... PRICE \$49.95
- STATISTICAL PACKAGE ..... PRICE \$24.95

PLEASE WRITE FOR COMPLETE DESCRIPTION

#### MORE SPECIALS:

- \*CENTRONICS 739-1 PRINTER REG. \$995/ NOW \$699
- \*CENTRONICS 704 PRINTER REG. \$2495/ NOW \$1795
- \*2716" — 10.95¢/3 FOR 9.95¢/10 FOR A B00

#### DEALER INQUIRIES INVITED

ADD \$3.00 FOR SHIPPING ON ORDERS UNDER \$100. FREE SHIPPING ON ORDERS OVER \$100. NEW YORK RESIDENTS ADD 7% SALES TAX

WESTERN NEW YORK MICROCOMPUTER INC.



P.O. BOX 84  
EAST AMHERST, NY 14051  
716/683-7344

## WHICH EDITING "SMART-TERMINAL" MONITOR ROM IS BEST FOR YOUR C1P?\*



ROM-TERM



ROM-TERM II

### FEATURES AVAILABLE ON BOTH ROMS AT THE TOUCH OF A KEY:

- Enter "Smart Terminal" mode for communications with a time share Dial-up computer network.
- Select half-duplex/full-duplex operation.
- Select auto or manual line feed at carriage return.
- Transmit a pre-prepared memory file from C1P to remote computer: This memory file can be a message, letter or program and is sent at full speed — saving time and telephone expense. Programs can be listed to memory file while in basic.
- Receive a message or program (or all transactions) into a memory file for later review on video, recording on tape and printing. The file can be downloaded to basic after you exit the "smart terminal" mode.
- Uploading/downloading of programs can be done in this memory file manner or directly into basic by using a new serial output distributor and a new "Control-L" load command.
- Return to basic program operation at the same point of execution from which you entered the "smart-terminal" mode.
- "Smart-Terminal" mode can be utilized with the modem/telephone disconnected in order to prepare memory files. Type directly to serial printer, send memory files to printer or tape, and to view tapes without interference from basic "Syntax Error."
- The serial output distributor can be turned on and off with a "control S" keystroke or with a poke which allows easy control of a serial printer from basic.
- Basic program lines can be recalled, edited and re-entered. The editing includes backspacing, forward spacing, deleting, typing over, inserting new text, and changing line # (duplicating a line). During editing, the cursor position and display are wrapped around, allowing operation on and displaying of an entire line up to 72 characters long. The preparation of line numbered messages can utilize these features — extremely handy for poor spelling, typists like me!
- Keyboard has been completely corrected to provide standard typing format. By the use of the control and repeat keys as modifiers, any character in the full USASCII 128 character set can be entered from the keyboard. This will give you all the characters you need for running Pascal and other high level languages in a remote computer.
- Video output may be halted at any time for easy viewing.
- Screen clear at keystroke.

ALL FEATURES ARE ROM RESIDENT AND ALWAYS AVAILABLE AT POWER ON.

### ADDITIONAL FEATURES PROVIDED IN THE ROM-TERM:

- Disk bootstrap — In disk operation you can alternate between ROM Basic and Disk Basic with a keystroke. Can Warm Start Disk Basic.
- Easy transfer of programs between disk and ROM Basic. [Use the ROM Basic for editing disk basic programs.]
- Memory files can be stored or recalled in Disk Basic, ROM Basic or the "Smart Terminal" interchangeably.

### ADDITIONAL FEATURES PROVIDED BY ROM-TERM II:

- A 48 column video display on series II C1P Revision "D" Superboard. Selection of 48 or 24 column video with a "Control-V" keystroke. Corrected "Syntax Error" messages.

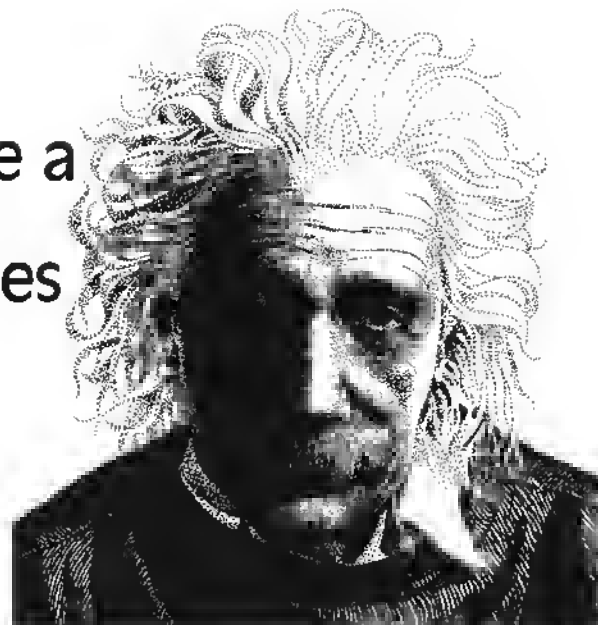
\*RECOMMEND THE ROM-TERM II FOR NON-DISK OPERATION OF SERIES II C1P (OR REVISION "D" SUPERBOARD) AND THE ROM-TERM FOR ALL OTHER SYSTEMS.

ROM-TERM AND ROM-TERM II ARE A LOT MORE THAN JUST "SMART TERMINAL" ROMS. THE EDITING, MEMORY FILE AND OUTPUT DISTRIBUTOR FEATURES ARE INVALUABLE. EASY INSTALLATION. JUST PLUG INTO REGULAR C1P MONITOR ROM SOCKET. ONLY \$59.95! ORDER NOW! Check with your Local Dealer. Phone orders/Visa/MC accepted. Sent Postpaid on prepaid Domestic orders.

#### MICRO-INTERFACE

3111 SO. VALLEY VIEW BLVD., SUITE I-101  
LAS VEGAS, NEVADA 89102  
Telephone: (702) 871-3263

“ You don't have to be a genius to figure out that the lowest prices on computers and peripherals are at **The Place Where You Go To Buy Computers, Inc.** ”



APPLE II PLUS  
APPLE III  
DOS 3.3  
APPLE PLOT  
APPLE PASCAL  
APPLE FORTRAN

APPLE WRITER  
GRAPHICS TABLET  
PEACHTREE  
DC HAYES ASSOC.  
NEC  
MICROSOFT

EPSON  
AMDEX  
ZENITH  
THE SOURCE  
VISICALC  
VISTREND

AUTHORIZED DEALER AND SERVICE CENTER

### MAIL ORDER SPECIALS

QTY.	DESCRIPTION	TOTAL
_____	EPSON MX 80 .....	\$444.99
_____	EPSON MX 80 F/T .....	\$574.95
_____	EPSON MX 300 F/T .....	\$724.95
_____	EPSON INTERFACE .....	\$ 79.99
_____	NUMERIC 24 KEY MULTIFUNCTION PAD .....	\$139.95
_____	NEC GREEN MONITOR 12" .....	\$219.95
_____	AMDEX COLOR MONITOR 13" .....	\$349.99
_____	ZENITH GREEN SCREEN 12" .....	\$124.95
_____	COOL STACK W/FAN .....	\$ 59.95
_____	COOL STACK WITHOUT FAN .....	\$ 32.95
_____	MICROSOFT RAM CARD .....	\$159.95
_____	MICROSOFT Z-80 CARD .....	\$284.99
_____	GRAPPLER INTERFACE .....	\$159.99
_____	GRAFRAX 80 .....	\$ 89.99
_____	SUP "R" TERM .....	\$319.95
_____	VIDEX .....	\$279.95
_____	Apple slider™ .....	\$ 29.95

Sub-Total

**TO ORDER CALL  
(213) 78-THINK**

Calif. Residents Add 6% Sales Tax  
Add 4% for shipping & handling **TOTAL**

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City, State, Zip \_\_\_\_\_  
Phone \_\_\_\_\_  
Credit Card # \_\_\_\_\_  
☐ VISA ☐ MASTERCARD Exp. Date \_\_\_\_\_  
Signature \_\_\_\_\_

**Just In Time For Christmas!!**

## Apple Slider™

*Apple Slider is the only device that makes the outside of your apple as useful as the inside.*

This versatile little unit, which plugs into the game I/O and attaches to the side of your APPLE allows you to operate in one of two modes. The first mode enables you to easily select between one of two devices that plugs into your computer (for example joysticks and paddles). You will never have to open your APPLE again to change game devices. The second mode enables you to take advantage of your APPLE'S ability to handle up to four game controllers at one time. In either mode Apple Slider™ can be configured to meet your specific needs, such as exchanging the X for the Y axis or changing push button numbers.

Apple Slider™ makes a great stocking stuffer, and is available exclusively from, **"THE PLACE WHERE YOU GO TO BUY COMPUTERS, INC."**

**ORDER NOW**

**\$29<sup>95</sup>**  
only

the place where you go to buy  
**Computers**  
incorporated 

"the complete communications and computer store"

5848 Sepulveda Blvd., Van Nuys, CA 91411  
(213) 78-THINK

APPLE II, APPLE III, APPLE WRITER, APPLE PLOT, APPLE PASCAL & APPLE FORTRAN ARE ALL REGISTERED TRADEMARKS OF APPLE COMPUTER INC.

# MICRO

## Letterbox

### Apple, OSI Readers Speak Out

Dear Editor:

I am an Apple user who loves to read computer journals — obviously about the Apple.

I came very close to cancelling my subscription to MICRO until your magazine started the Apple Bonus section. The last two or three issues have been very good and I decided to continue my subscription.

I believe it is important to provide the majority of your readers with articles that they can use, and it is apparent that Apple users are in the majority (evidence from your poll). I think it is a grave error to try to cover too much ground because, in trying to please everyone, you may be able to satisfy no one!

Please keep the Apple articles coming. I wish you continued success.

Warren Ostlund, M.D.  
6616 Southcrest Drive  
Edina, MN 55435

Dear Editor:

MICRO #40 showed that 39% of your readers have OSI systems. I hope this will cause an increase in the numbers of articles written for OSI. It would be nice to see 39% of the systems-oriented articles for OSI; after all, we are paying for 39% of your (our?) magazine.

Dennis W. Smith  
557 S. 10th  
Salina, KS 67401

*Editor's note: The types of articles we publish are directly related to the material we receive from our authors. Recently we've been inundated with Apple articles, but have received little OSI material. If you're an OSI user, why not try submitting a program to*

*MICRO that you've developed on your system! We are also beginning to generalize articles so that a program can run on more than one system.*

Dear Editor:

I have been trying to get more OSI users to flood you with articles in an effort to prevent an Apple takeover. Michel Piot was afraid his English was not good enough for MICRO, but I convinced him to send in the article anyway. I'm glad to see it appeared in the July issue [38:79].

I would like to see more articles of the type "How to convert your KIM into a Dedicated Coffee Percolator" as described in MICRO 36:16. A large fraction of your articles are being provided by us skinflint bare-board hackers.

I find the 6502 bibliography next to useless. This may have been appropriate when 6502 articles were few and far between. And listing the contents of MICRO seems redundant. Perhaps the listings should be limited to articles specifically about the 6502 chip rather than just machines using that chip.

Earl Morris  
3200 Washington  
Midland, MI 48640

*Editor's note: We appreciate your efforts to supply us with OSI material and authors — please continue!*

*We have been working with Dr. Dial on shortening the Bibliography, but feel it is still a worthwhile department. Dr. Dial now includes only the most pertinent 6502 articles.*

Dear Editor:

Well, you finally did it: squeezed OSI out of the September, 1981 issue entirely. But it wasn't hard to see it coming with "Challenges" lasting only four issues and the "Small Systems Journal" going next. Not your fault you say, but no attempt at a replacement.

I have stopped subscribing to better magazines than yours because they let me down, and I'm sure the OSI advertisers in the September, 1981 issue feel the same way. I bet you're not surprised that OSI is gone from the back cover.

Why not just change your name to "6809 Apple Butter" and be done with it?

William F. Hertel  
P.O. Box 1226  
Bullhead City, AZ 86430

*Editor's note: Our September issue did contain an OSI article — "The Disk Switch," (40:15). We've scheduled an OSI feature for March 1982. (We also had an OSI feature in July 1981.) OSI users have not been forgotten!*

### Atari Ad Attacked

Dear Editor:

As a 6502 expert and student of intellectual property law, I resent the implications of the Atari advertisement on page 17 of your October issue, and gladly take this opportunity to set your readers straight.

Atari may not be happy with the fact that others have "adapted" their ideas to other games or computers. Tough!

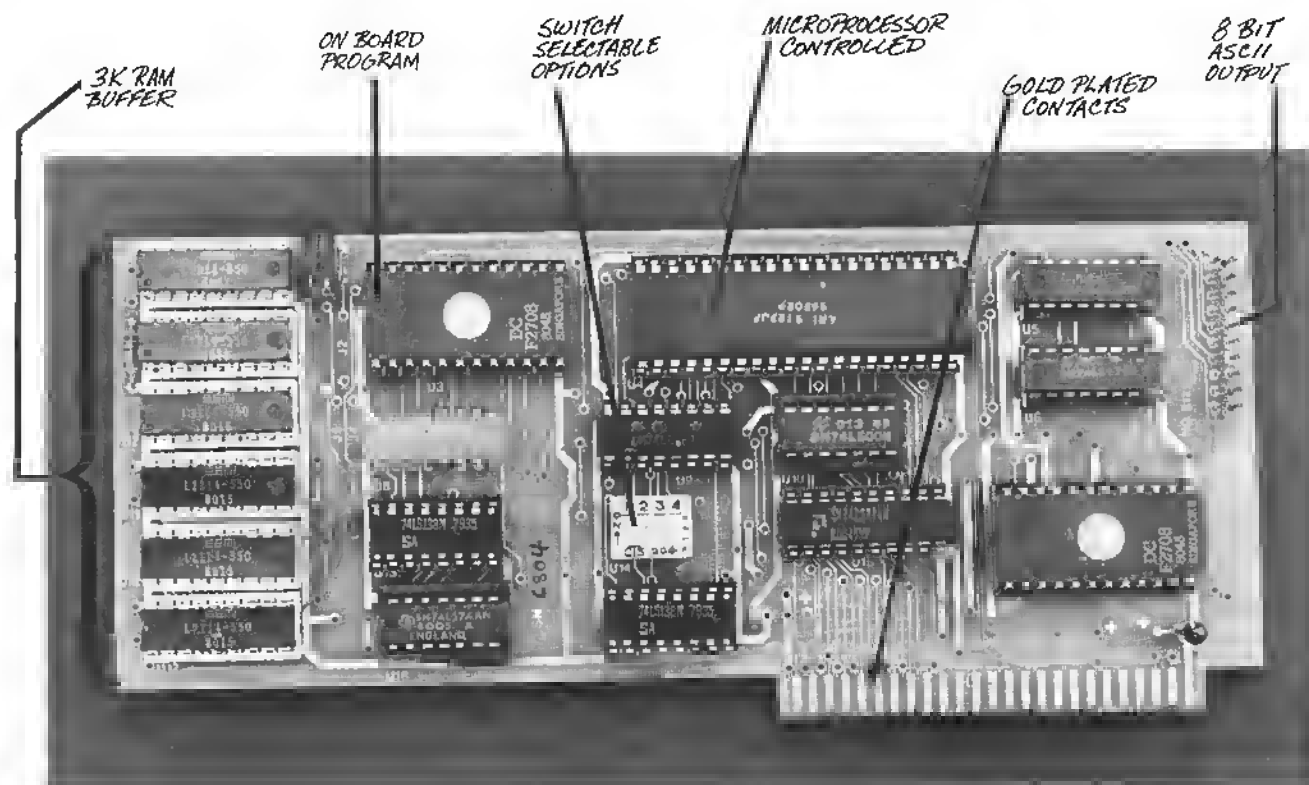
Unless Atari has a patent, they have no complaint about "adapting" or other use of their ideas. Copyright does not afford that protection. If Atari wants the law to be otherwise, let them appeal to Congress rather than attempt to deceive your readers. I gladly announce to you and the "Patent Counsel" of Atari that I am freely adapting their ideas in programs, and will continue to do so until they gain control. Suit will have to be brought in Federal District Court of Austin, TX.

Jim Kirby  
502 South Park Dr.  
Austin, TX 78704

MICRO



# SMART II MEANS FAST.



## SMART II MICROPROCESSOR CONTROLLED PARALLEL PRINTER INTERFACE

Be Smart! With the new **SMART II** parallel printer interface for your Apple II\* Computer you can have print spooling, left and right margin control, and adjustable tab stops. The **SMART II** can buffer over three thousand characters before it signals the Apple to stop sending. This eliminates the start - stop problem created with conventional printer cards and will keep your printer printing (instead of waiting).

The **SMART II** is compatible with all known hardware and software including the Pascal Language System, Microsoft Z-80 Softcard\*, and Hayes Micromodem II\*.

### FEATURES:

- Compatible with all Centronicstype Parallel printers including the Epson MX-70/80/100, Centronics 737/739/779, IDS 440/445/460/560, C. Itoh Starwriter, Anadex 8000/9000/9500, and similar printers.
- 3K Print Spooler which acts much larger when spooling text because of a unique compaction routine.
- On board software supports typewriter-like TAB Commands and has 16 software selectable TAB positions. Left and right margin commands are also software selectable to ease in the justification of reports and listings.
- Use with the Hayes Micromodem II\* to prevent loss of characters while on line with a host computer.

AVAILABLE AT YOUR LOCAL APPLE DEALER

INTRODUCTORY  
RETAIL PRICE

**\$225.**

(cable and  
connector  
included)

**HARDWARE:** 6800 type microprocessor  
Two ROMs  
Six static RAMs  
Eight support ICs  
4 ft printer cable and connector  
High quality board with gold plated edge connector

## OLENSKY BROS., INC.

COMPUTER SALES DIVISION

3763 AIRPORT BLVD.

MOBILE, AL 36608

TOLL FREE: 800-633-1636

DEALER INQUIRIES INVITED.

\* Apple is a registered trademark of Apple Computer, Inc.  
\* Z-80 Softcard is a registered trademark of Microsoft.  
\* Micromodem II is a registered trademark of Hayes, Inc.

# DATA CAPTURE 4.0<sup>®</sup>

The most advanced and easiest to use telecommunications program for use with the MICROMODEM II<sup>™</sup> or the Apple COMMUNICATIONS CARD<sup>™</sup>.

If you use your Apple II<sup>®</sup> computer to communicate with other Apples or with timesharing systems, then you need Data Capture 4.0.

If you want to save stock quotes, airline schedules, electronic mail, or other data from a remote computer system for future use, then you need a smart terminal program for your Apple II<sup>®</sup>. Data Capture 4.0 is the most user friendly and most flexible program of this type. It is specifically designed to take advantage of all the features of the Micromodem II<sup>™</sup>, but it works equally well with the Apple Communications Card<sup>™</sup> and several other popular serial interface cards.

Data Capture 4.0 is the only Apple II<sup>®</sup> smart terminal program available which is fully copyable and modifiable. This means that you don't have to worry about backup. Go ahead and make all the backup copies you need.

The unprotected format and helpful documentation make modifications to Data Capture 4.0 very easy to perform. In addition, full technical support is available by phone from Southeastern Software.

Data Capture 4.0 has many other features. Incoming data files are automatically captured regardless of length. Data in the memory buffer can be viewed, edited, printed, saved to or loaded from disk, or transmitted to the remote system at any time. An unattended mode of operation is provided so that you can call your Apple from another location and send data to it or load data from it. Data Capture 4.0 is fully compatible with the Apple III<sup>®</sup> in

Select One Of The Following:

- A) wait Call
  - C) analog Disk
  - D) delete Text
  - E) enter Phone Number
  - H) hangup Phone
  - I) insert Text
  - L) list Text
  - M) merge From File
  - P) print Text
  - Q) quit Program
  - S) send Text
  - T) toggle
    - A) alternate Drive (1/2)
    - B) baud Rate (110/300)
    - C) capture (ON/OFF)
    - D) duplex (FULL/HALF)
    - L) local Carrier (ON/OFF)
    - S) special Characters (ON/OFF)
    - T) transmit
  - W) write To File
- Which ? ( Press **RETURN** to Abort )

Drive = 1      Capture ON      Transmil ON  
Lines = 15      Sp. Char. ON      Duplex FULL  
Baud = 300      Carrier ON

Data Capture 4.0

Terminal =  
@ C 123 45

XYZ Network Connected  
Please Sign-on  
#ID ABC123

Welcome to the XYZ Network  
Time on 12:35:41

emulation mode. It is also compatible with all popular lower case adapters for the Apple II<sup>®</sup>, including the widely used shift key modification. An automatic logon utility for use with the SOURCE is provided with Data Capture 4.0. Also included is a HELP text file containing the latest tips and suggestions on using Data Capture 4.0 effectively (many of these are the result of feedback from customers).

See your local Apple dealer today for a demonstration of Data Capture 4.0 or order direct from Southeastern Software at the address below.

(Please include \$2.50 for postage and handling.)

If you presently own a previous version of Data Capture you may upgrade to the new version for the difference in price plus \$2.50 for postage and handling. MASTER CARD or VISA orders may be placed by phone.

DATA CAPTURE 4.0 .....\$65.00  
DATA CAPTURE 4.0 / 80\* .....\$90.00

\*Specify either Videx, Smarterm, Double Vision or Sup 'R' Terminal version

— Dealer Inquiries Invited —

Requires DISK II<sup>™</sup>, Applesoft II<sup>™</sup> and 48K of Memory

DATA CAPTURE 4.0© 1980-Southeastern Software

\*Apple<sup>®</sup>, Apple II Plus<sup>®</sup>, Disk II<sup>®</sup> and APPLESOFT II<sup>®</sup> are trademarks of Apple Computer Company.

SOURCE - Source Telecomputing Corporation

\*Micromodem<sup>®</sup> is a trademark of D.C. Hayes Associates, Inc.

## Southeastern Software

6414 Derbyshire Drive • New Orleans, Louisiana 70126  
(504) 246-8438 or (504) 246-7937

master charge  
THE INTERCARD

DataAmerica

VISA

# 80 x 25

PET/CBM™

2000/3000/4000 Series

not using a CRT, or display controller chip

\$275.00\*

Select either  
**80 x 25** or **40 x 25**

On The  
Built-in  
Display

## From the keyboard or program

Displays the full, original character set

Available from your local dealer or:

**EXECOM CORP.**

1901 Polaris Ave.

Racine, WI 53404

Ph. 414-632-1004

\*Plus installation charge of \$75.00

Available only for Basic 3.0 & Basic 4.0

PET & CBM™s

trademark of Commodore Business Machines

# SUPER SKETCH

THE ULTIMATE  
GRAPHICS PROGRAM

- \* KEYBOARD OR  
PADDLE CONTROL
- \* DRAW ALPHA-NUMERICS  
OF ANY SIZE, COLOR OR ANGLE
- \* MERGE ANY HI-RES  
PICTURES TOGETHER
- \* CREATE AND SAVE SLIDE SHOWS
- \* MOVE ENTIRE  
HI-RES PICTURES ANYWHERE  
ON THE SCREEN
- \* APPLE II+ 48K DISK

TO ORDER: SEND \$24.95 TO

JAY ROSENBERG'S SUPER SKETCH

5 FRASER AVE.

MONTICELLO, N.Y. 12701

N.Y.S. RESIDENTS ADD 7% SALES TAX

## (LABEL), Y (LABEL,X) LABEL + INDX-I

### 6502 Assembler/Editor

- APPLE
- ATARI
- PET
- KIM
- SYM

Before you buy that off-brand Assembler/Text Editor, note that EHS is the only company that provides a line of compatible ASM/TED's for the PET/APPLE/ATARI/SYM/KIM and other microcomputers.

When you make the transition from one of these 6502-based microcomputers to another, you no longer have to relearn peculiar Syntax's, pseudo ops, and commands. Not only that, EHS ASM/TED's are the **only resident 6502 Macro Assemblers** available and they have been available for several years. Thus you can be sure they work. Our ASM/TED's may cost a little more but do the others provide these **powerful features**: Macros, Conditional Assembly, String Search and Replace, or even up to 31 characters per label? Before you spend your money on that other ASM/TED, write for our free detailed spec sheet.

#### MACRO ASM/TED

- For APPLE/ATARI/PET/SYM/KIM
- Other than our MAE, no other assembler is as powerful.
- Macros/Conditional Assembly.
- Extensive text editing features
- Long Labels
- Designed for Cassette-based systems.

\$49.95

#### MAE ASM/TED

- For APPLE/ATARI/PET
- The most powerful ASM/TED
- Macros/Conditional and Interactive Assembly
- Extensive text editing features
- Long Labels
- Control files
- Designed for Disk-based Systems.

\$169.95



**EASTERN HOUSE SOFTWARE**  
3239 Linda Drive  
Winston-Salem, N. C. 27106 USA  
(Dealer Inquiries Invited)

**PHONE ORDERS**  
(919) 924-2889  
(919) 748-8446



.EN .BY .OS .BA .DE .CE

LDA STA IDX STX LDY STY

SET IFM IFP IFN IFE

# MICRO

## PET Vet

By Loren Wright

### Alternate Languages for the PET

It seems we have been deluged in the past year by alternative languages for the PET, all purporting to be better than BASIC in one or more important ways. Currently on the market are compiled BASICs, the extended Waterloo MicroBASIC (interpreted) for the SuperPET, at least two Pascal versions, and several versions of FORTH. In addition, there are non-standard languages which combine the features, advantages, and disadvantages of the better-known languages, and add some of their own.

Next month we'll focus on Pascal. The three-month "Pascal Tutorial" series by Victor Fricke concludes, and will be accompanied by several other articles to help you learn more about Pascal, its inner workings, and some applications. The PET Vet column will survey the available Pascals for the PET. The February issue will feature FORTH, and I hope to survey the PET FORTHs then.

Now let's take a look at why there is a need for all these other languages, what kinds of improvements they make, and what sacrifices are necessary.

### What's Wrong with BASIC?

BASIC is inadequate in several areas:

1. It is too slow for many applications. Therefore, programmers must resort to writing machine language, which can be very difficult and time consuming.
2. It occupies too much memory, reducing the size of programs that can be executed.
3. It is often difficult to understand a BASIC listing. The necessary comments consume memory and slow execution speed, so they are often omitted.

BASIC is an interpreted language. Your BASIC program is analyzed by a program called an interpreter, which occupies most of your PET's BASIC ROMs. As each instruction in the BASIC program is encountered, it must first be recognized and then executed using a particular prepackaged routine to perform that function. It doesn't matter how many times that instruction has been encountered before; it must still be interpreted before it is executed. You can see that a lot of time gets wasted in this redundancy. Also, it means that the BASIC program must be in memory in order to be interpreted.

Compiled languages require an additional step before you can run your program. The source statements must be reduced to executable machine code by a program called a compiler. Then this reduced program may be executed

4. It is not a "structured" language. Such features as global vs. local variables, named procedures, long variable names, and a logical program flow are quite foreign to most BASICs. Structured programs take longer to write, but the results pay off in a number of ways.
5. Although BASIC is a "universal language," the implementations of it are different. In other words, you can't just type into your PET a program that was written for another computer, without knowing a lot about that other BASIC dialect.
6. BASIC encourages sloppy programming with its convenience and lack of structure.

Of course there's a lot right with BASIC. The biggest advantage is that it comes with most microcomputers. Communication with peripheral devices and screen editing are usually much more difficult in the alternate languages. Everyone knows some BASIC, even if it's a slightly different dialect.

### Compiled vs. Interpreted

directly. The source and the compiler are now dispensable, and the memory they occupied during compilation is available for other uses. However, if you need to make changes, you must go back to the source program, make the necessary changes, and recompile before you can execute the new version.

Microcomputer implementations of Pascal take an "in between" approach. The source statements are compiled to a reduced form called P-code (or "P" for pseudo). This P-code is then interpreted by the "P-machine," (which is really another program). This can operate faster and more efficiently because of the reduced form of the program. The P-code itself is not directly executable by the 6502. In both purely compiled and P-code languages, the source program does not have to be in memory when execution takes place.

BASIC is also easy to learn, and BASIC programs are easy to debug. The fact that it's so easy is reason enough to apply it in most situations. So if you aren't bothered significantly by any of the above "BASIC problems," by all means stay with BASIC.

Several of the alternate languages improve speed, consume less memory, and allow convenient manipulation of memory contents, but usually are more difficult to write and read. VIGIL, reviewed here in August, is such a language, oriented toward easy manipulation of graphics in game applications. FORTH is another, employing a threaded structure and a user stack. I'll begin my coverage of alternate languages with RPL, a new language designed to compete with FORTH.

### RPL — from Samurai Software

RPL stands for Reverse Polish Language, as some of you may have suspected. It refers to the sort of backward notation used not only in this language, but also on Hewlett-Packard calculators and in FORTH. The key feature to all of these is the

(Continued on page 104)

# FOCUS ON THE 6809 MICRO WORTH SWITCHING FOR

## FOCUS ... ON ITS SUPERIOR HARDWARE

- 8809E Microprocessor provides 8-bit economy with 16-bit capabilities, position Independent code and many advanced features
- Commercial quality Keyboard with full UPPER/lower case ASCII, numeric keypad and cursor control keys
- Two double sided, double density mini diskettes with 840K bytes of IBM compatible storage
- Full Video with programmable screen formats, bit mapped graphics, user definable character sets, reverse video and hardware scrolling, plus a light pen interface
- Full Communications support for RS-232 at 50 to 19.2K baud with programmable data formats
- Built-In I/O Drivers include 6 parallel I/O ports, 3 serial I/O ports, 6 timers/counters, 20 mA current loop, and a programmable cassette interface

## FOCUS ... ON ITS EXTRAORDINARY SOFTWARE

- Choice of two 'Universal' 8809 Disk Operating Systems supported by many companies: FLEX™ or OS-9™
- Extended Floating Point Disk BASIC Interpreted and Compiled
- Text Editor and Macro Assembler
- Full feature MicroMon debugging monitor
- Built-in Word Processor

## FOCUS ... ON ITS VERSATILE EXPANDABILITY

- IEEE-488 Bus Controller option for instrumentation
- Supports multiple 8" diskette drives
- PASCAL, FORTH and other high level programming languages are available
- Complete Application Packages are available from many software sources
- Add-on Hardware includes: Date/Time, Opto-Isolators, Stepper-Motor Controller, A/D and D/A, RAM and EPROM Memory, and others from several manufacturers

## FOCUS ... ON YOUR APPLICATION REQUIREMENTS

- FOCUS provides a completely integrated system of hardware and software, so that you can concentrate on your application requirements

FLEX is a trademark of Technical Systems Consultants  
OS-9 is a trademark of Microware Systems Corporation  
FOCUS is a trademark of The Computerist, Inc.

**THIS IS  
FOCUS**



**\$3495<sup>00</sup>**

**Very Complete**

**THE  
COMPUTERIST®**

34 Chelmsford Street  
Chelmsford, MA 01824  
Phone: 617/256-3649 Telex: 955318 INTL DIV

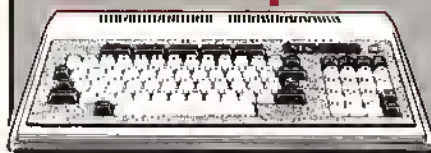


# Consumer Mail Order computers DISCOUNTS

**ORDER  
TOLL-FREE**

## NEC

### Microcomputer



PC-8001A 32K Computer... CALL  
PC-8012A I/O Unit w/32K RAM... CALL  
PC-8013A Dual Mini-Disk Drive Unit... CALL  
PC-8001 Multi Cardware (FDI/O & 32K)... CALL  
CP/M 2.2 Operating System for NEC... 129  
WordStar configured for NEC... 299  
SuperCalc configured for NEC... 279  
NEC Wordprocessor & Accounting Software... CALL  
Many more software packages and languages:  
(Pascal, Fortran, Cobol, etc) are available configured for  
the NEC 8001A Computer.  
Please call or write for a product price list.



**ATARI  
800  
16K**

**\$749**

Atari 400 w/16K... 349  
410 Program Recorder... 65  
810 Disk Drive... 449  
825 80 col. 7x8 Dot matrix impact printer... 699  
822 40 col. Quiet Thermal Printer... 349  
850 Interface Module... 159  
Atari 16K Ram Module... 69  
Atari Ramcard 32K Module... 189

### Video Monitors

Amdek/Leadex Video 100 12" B&W... 155  
Amdek/Leadex Video 100G 12" Green Phosphor... 179  
Amdek (Hitachi) 13" Color w/audio output... 389  
NEC 12" Green Phosphor Display J8-1201M... CALL  
NEC 12" Lo-Res Color Display... CALL  
NEC 12" Hi-Res RGB Color Display... CALL  
Sanyo 9" B&W Display... 185  
Sanyo 9" Green Phosphor Display... CALL  
Sanyo 12" B&W Display... 269  
Sanyo 12" Green Phosphor Display... 285  
Sanyo 13" Color Display... 449  
Zenith 12" Green Phosphor Display ZVM-121... 149



**ZENITH  
12"  
GREEN**

**\$149**

**VIC20**

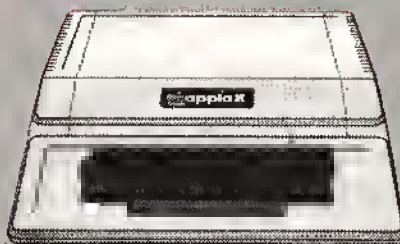
**\$259**

Personal  
Computer

Color \* Sound \* Graphics  
Call or write for more info.  
Disk drives available soon!



**Apple Computer**  
Authorized Dealer



### APPLE II PLUS

**16K NOW \$1025**

**48K NOW \$1089**

**64K\* NOW \$1199**

\*48K Apple with 16K RamBoard



**APPLE DISK  
DRIVES**

**\$439**

w/controller and DOS 3.3 **\$499**

### Apple Cards and Hardware

Language System w/Pascal & BASICs... 379  
Silentype Printer w/Interface card... 349  
Hayes Micromodem II... 299  
Novation Apple-Cal... 339  
Videx Videolerm 80 column card... 269  
Videx Keyboard Enhancer... 115  
Z-80 Softcard by Microsoft... 299  
16 K RamCard by Microsoft... 169  
CPS Multi-Function card... 189

### Software for the Apple

VisiCalc version 3.3... 159  
VisiFile (NEW data base manager)... 199  
VisiText/VisiPlot... 219  
DB Master... 169  
WordStar (Apple 80 col. version)... 249  
Dow Jones Portfolio Evaluator... 45  
Apple Post... 45  
Apple Writer... 65  
Dow Jones News & Quotes Reporter... 85  
Apple Plot... 60  
TaxPreparer... 99  
Real Estate Analysis... 129

**16K RAMBOARD by ConComp**  
for Apple II Computers

**\$129<sup>95</sup>**

FOR ONLY



AVAILABLE NOW

## S-100

California Computer  
Systems

Floppy Disk Controller... \$369  
64K Dynamic Ram Board, 200ns... \$499  
Z-80 CPU board w/monitor ROM... \$269

16K Static memory board, 200ns... 369  
32K Static memory board, 200ns... 599  
S-100 12 Slot Mainframe... 475  
4-Port Serial Interface... 299  
2-Port Serial/2-Port Parallel Interface... 299  
4-Port Parallel Interface... 229

### Printers

**Silentype**  
w/Apple II Interface

**\$349**

**Epson  
MX-80 or  
MX-80 FT  
CALL**



Anadex 9501 w/2K Buffer... 1349  
C. Itoh Starwriter 25 CPS daisywheel... 1449  
C. Itoh Starwriter 45 CPS daisywheel... 1649  
Epson MX-70... CALL  
Epson MX-80 & MX-80 F/T... CALL  
Epson MX-100... CALL  
NEC 8023 Impact Dot Matrix... 695  
NEC Spinwriters (Latest models)... CALL  
Paper Tiger IDS-445G w/graphics... 699  
Paper Tiger IDS-460G w/graphics... 949  
Paper Tiger IDS-560G w/graphics... 1249  
Silentype Printer w/Apple Interface... 349  
Qume Spinni Daisywheels (Latest models)... CALL

**ORDER TOLL FREE  
800-854-6654**

In California and

outside continental U.S.

**(714) 698-8088**

Telex 695-000 Beta CCMO

### Send Orders To:

Ordering information: Phone orders using VISA, MASTERCARD, AMERICAN EXPRESS, DINER'S CLUB, CARTE BLANCHE, bank wire transfer, cashier's or certified check, money order, or personal check (allow ten days to clear). Unless prepaid with cash, please add 5% for shipping, handling and insurance (maximum 5.00). California residents add 6% sales tax. We accept CODs. OEM's, institutions and corporations please send for a written quotation. All equipment is subject to price change and availability without notice. All equipment is new and complete with manufacturer's warranty (usually 90 days). Showroom prices may differ from mail order prices.

**consumer  
computers** Mail Order

**8314 Parkway Drive  
La Mesa, Calif. 92041**

# MICRO

## Microbes and Updates

Dear MICRO:

The utility program "Binary File Parameter List," by Clyde R. Camp (MICRO 38:45) produces an incorrect count of free sectors when used with DOS 3.3. The reason is the final statement in line 1500:  $V = \text{INT}(V/2)$ . This drops the least significant bit in the two-byte map for each track, so that sector 0 is never counted. I have made a small change in line 1500 and added line 1505 to correct this (see below).

```
1500 FOR I = 56 TO 195
      STEP 4: S = PEEK (BASE
      + I) * 256 + PEEK (BASE
      + I + 1): V = INT (S / 2)
1505 IF S / 2 < > INT (S / 2)
      THEN CNT = CNT + 1
```

J. Morris Prosser  
3157 Indian Village Rd.  
Pebble Beach, CA 93953

Dear MICRO:

I received the October issue of MICRO today containing my article "Solar System Simulation, Part 2," (41:108). I found one error in a DATA statement. Three values were duplicated. Below is the correct version of line 3330.

```
15,57,-22,-29,16,3,
-19,-40,16,18,-25,
-28,16,28,-26,-19,16,
33,-28,-7,16,47,-34,
-12,16,48,-37,-58,16,
50,-42,-17
```

Dave Partyka  
1707 N. Nantuckett Dr.  
Lorain, OH 44053

the text on page 105, second paragraph under BASIC Program, the sentence "The assignment of a value to X here..." would need to read, "The assignment of a value to M here..." to correspond.

G. Roger Heal  
University of Salford  
Salford M5 4WT,  
Lancashire, England

Dear MICRO:

The program listing in "Sorting with Applesoft," by Norman P. Herzberg (MICRO 39:92) contains several errors. The corrected lines are:

```
750 TEMP = R(J):R(S(J)) =
      TEMP:R(J) = J:S(TEMP) =
      S(J):S(J) = J
```

```
2000 REM SORT
```

```
5050 DATA 169,76,141,245,3,
      169,58,141,246,3,169,3,
      141,247,3,96,32,227,223,
      133,133,132,134,32,190,
      222,32,227,223,160,2,
      177,133,72,177,131,145,
      133,104,145,131,136,16,
      243,96,0
```

J.C. Shellenbarger  
1181 S. Sunkist St., Apt. 20  
Anaheim, CA 92806

Dear MICRO:

I have just been re-reading my article "Interfacing Two 12-Bit A/D Converters to an AIM" (41:100) and I have noticed an error. In listing 2, the BASIC line 30 has been changed from  $X = \text{USR}(N)$ , in my original text, to  $M = \text{USR}(N)$ . This does not make any particular difference to operation, but in

DLIST 1500, 1505

```
1500 FOR I = 56 TO 195 STEP 4: S =
      PEEK (BASE + I) * 256 + PEEK
      (BASE + I + 1): V = INT (S /
      2)
1505 IF S / 2 < > INT (S / 2) THEN
      CNT = CNT + 1
```

Dear MICRO:

In regard to the September issue, Clement Osborne's "Shaper" is fantastic. I tried several others and even wrote my own, but this beats all.

Here are a couple of additives which helped me through it, but they're not necessary for operation.

David L. Angell  
18 Fairview Ave.  
Cranston, RI 02905

DLIST 1030

```
1030 60SUB 1325:N = H + OE
```

DLIST 1180

```
1180 TEXT : POKE 34,5:S = OE: GOTO 1050
```

DLIST 1325,1330

```
1325 UTAB t: HTAB t: PRINT "0-MOVE UP          4-PLOT & MOVE UP          t-MOU
      E RIGHT      5-PLOT & MOVE RIGHT      2-MOVE DOWN      6-PLOT & MOVE DOWN
      N          3-MOVE LEFT      7-PLOT & MOVE LEFT"
1330 POKE 34,5: UTAB 24: RETURN
```

DLIST 6030,6032

```
6030 PRINT : PRINT "WHAT IS THE STARTING LOCATION OF TABLE ": PRINT : PRINT
      "(IF 0 THEN DECIMAL LOCATION IS 24567.)": PRINT : INPUT "      IN DEC
      INAL -> ":SL
6032 PRINT : PRINT "DOUBLE CHECK STARTING LOCATION ": PRINT : INPUT "IS
      IT CORRECT ? ":A$: IF LEFT$(A$,OE) < > "Y" GOTO 6030
```

Dear MICRO:

I was very pleased to see my article "Monobyte Checksum Dumper" printed in the July issue of MICRO (38:67).

A few remarks, or corrections:

Listing 1: 1E2C C904 CMP #04 should read 1E2C E004 CPX #04.

The missing part of listing 1 was already corrected in Microbes and Updates [40:93]. Here are the lines omitted from listing 2:

Peter D. H. Broers  
Overijsselstraat 9  
5144 EH Waalwijk, Netherlands

**MICRO**

## Get more from your microcomputer.

State-of-the-art hardware and software articles in MICRO help you

- Understand your computer's inner workings
- Keep up with high-level language developments
- Exploit the full capabilities of your microcomputer

Read the monthly that thousands of professionals use to get the most out of their Apple, Atari, AIM, PET, OSI, or other 6502- or 6809-based system. \$18 in U.S. (\$21 elsewhere).

CALL TOLL-FREE



800-227-1617, ext. 564

(in Calif: 800-772-3545, ext. 564)

**MICRO**

34 Chelmsford St.  
P.O. Box 6502  
Chelmsford,  
MA 01824



## Broers' Listing 2

```

1F69 18          ADCHCK CLC          ;ADD THE BYTE TO THE CHECKSUM
1F6A 65E6        ADC CHCK
1F6C 85E6        STA CHCK
1F6E 9002        BCC *+4
1F70 E6E7        INC CHCK+1
1F72 60          RTS
1F73             ;
1F73 208A1F      ADRIN JSR DIGIN      ;GET 2 HEX DIGITS
1F76 0A          ASL                ;AND CALCULATE BYTE, STORING IT
1F77 0A          ASL                ;IN LOCATION "ADRES+Y"
1F78 0A          ASL
1F79 0A          ASL
1F7A 99E000      STA ADRES,Y
1F7D 208A1F      JSR DIGIN
1F80 19E000      ORA ADRES,Y
1F83 99E000      STA ADRES,Y
1F86 88          DEY
1F87 10EA        BPL ADRIN          ;REDO FOR Y+1 BYTES
1F89 60          RTS
1F8A             ;
1F8A 20EEFF      DIGIN JSR BYTIN     ;GET ONE HEX DIGIT
1F8D 20EEFF      JSR BYTOUT         ;DISPLAY IT
1F90 2093FE      JSR $FE93          ;TEST IT FOR VALID HEX AND MAKE BINARY
1F93 30F5        BMI DIGIN         ;0-15. IF NOT VALID, REDO.
1F95 60          RTS
1F96             ;
1F96 A0FF        PRMPTS LDY #$FF    ;MESSAGE PRINTER "PROMPTS"
1F98 08          PLOOPA INY         ;FIND MESSAGE NR. X
1F99 B9AE1F      LDA MESSAG,Y
1F9C D0FA        BNE PLOOPA
1F9E 0A          DEX
1F9F D0F7        BNE PLOOPA
1FA1 08          PLOOPB INY        ;AND PRINT (& SAVE?)
1FA2 B9AE1F      LDA MESSAG,Y
1FA5 F006        BEQ RETURN
1FA7 20EEFF      JSR BYTOUT
1FAA 4CAllF      JMP PLOOPB
1FAD 60          RETURN RTS
1FAE             ;
1FAE 00          MESSAG BYT 00      ;MESSAGE 0
1FAF             ;
1FAF 455252      MESSA ASC 'ERROR << HIT G' ;ERROR MESSAGE
1FB2 4F5220
1FB5 3C3C20
1FB8 4B4954
1FBB 2047

1FBD 00          BYT 00            ;DURING THE LOADING
1FBE             ;
1FBE 0A0D        MESSB HEX 0A0D     ;MESSAGE 2--MESSAGE WHEN
1FC0 44554D      ASC 'DUMP B/M'     ;STARTING THE DUMPER
1FC3 502042
1FC6 2F4D
1FC8 00          BYT 00
1FC9             ;
1FC9 0A0D        MESSC HEX 0A0D     ;MESSAGE 3--ASKING FOR
1FCB 465253      ASC 'FRST/LAST/AUTO?' ;THE ADDRESSES
1FCE 542F4C
1FD1 415354
1FD4 2F4155
1FD7 544F3F
1FDA 0A0D        HEX 0A0D
1FDC 00          BYT 00
1FDD             ;
1FDD 0A0D        MESSD HEX 0A0D     ;MESSAGE 4--ASKING FOR A "Y"
1FDF 524541      ASC 'READY ?'     ;WHEN READY TO DUMP
1FE2 445920
1FE5 3F
1FE6 00          BYT 00
1FE7 0A0D        MESSE HEX 0A0D     ;MESSAGE5--LOADER START
1FE9 062E31      STR '.1F00/'
1FEC 463030
1FEF 2F          BYT 00
1FF0 00          BYT 00
1FF1             ;
1FF1 2E3146      MESSF ASC '.1F00G' ;MESSAGE 6--LOADER AUTOSTART
1FF4 303047
1FF7 00          BYT 00
1FF8             ;
1FF8 0D          MESSG HEX 0D        ;MESSAGE 7--BASIC POINTER
1FF9 2E3030      ASC '.0079/'
1FFC 37392F
1FFF 00          BYT 00
2000             ;
                END

```

# NOW AVAILABLE!

## IN DEPTH

AT SELECTIVE APPLE DEALERS  
WORLD-WIDE

136 pages of timeless  
reference material on  
heavy duty stock.

- **APPLESOFT FROM  
BOTTOM TO TOP**
- **APPLESOFT  
INTERNALS**
- **PROGRAM  
SPLITTER**
- **AMPLIFYING  
APPLESOFT**
- **HI-RES NOTES**
- **and more**



**Dealer Inquiries Invited**

**Membership and dealer information:**

**Apple Pugetsound Program Library Exchange**  
**304 Main Ave. S., Suite 300-M**  
**Renton, WA 98055**  
**(206) 271-4514**



# A TEAM OF 6809 SUPERSTARS: Smoke Signal's Chieftain™ Computer, and Software by Microware®



## HERE'S THE **TOTAL 6809-BASED SYSTEM** FOR THOSE WHO DEMAND UNSURPASSED POWER, FLEXIBILITY AND RELIABILITY

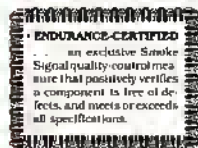
After years of worldwide use in diverse and challenging applications, the outstanding performers in 6809 computer operations are SMOKE SIGNAL and MICROWARE. These leading companies are recognized as the undisputed choices **when there is no room for compromises.**

### WHY SMOKE SIGNAL AND MICROWARE LEAD THE 6809 FIELD

Smoke Signal began pioneering research and development on 6800/6809-based computer systems back in 1977. Microware worked three years to perfect OS-9™ and BASIC09.™

Both companies have evolved outstanding 6809-based products from early engineering research, **and both pay almost fanatical attention to detail.** For example . . .

SMOKE SIGNAL's 6809-based Chieftain™ computer series has **proven** its superiority in hundreds of demanding tasks. From gold-plated connectors to highest-quality materials throughout, each Chieftain™ is built to deliver absolute dependability from day one, and **stay** that way through years of service.



Every Chieftain™ is meticulously **ENDURANCE-CERTIFIED** at 2.2 MHz. That's SMOKE SIGNAL's endorsement of product perfection.

MICROWARE's state-of-the-art OS-9 UNIX®-like operating system and the BASIC09 language have been developed in close coordination with computer manufacturers to maximize optimum system performance. The finest possible support and

\*UNIX is a trademark of Bell Telephone Laboratories.



**SMOKE SIGNAL  
BROADCASTING**



**MICROWARE**  
P.O. Box 4865  
Des Moines, Iowa 50304

31336 VIA COLINAS  
WESTLAKE VILLAGE, CA 91362  
TEL (213) 889-9340

documentation further ensure satisfaction. Microware software performance is best summed up in this remark by a 25-year computer veteran:

*"BASIC09 IS THE FINEST HIGH-LEVEL LANGUAGE I'VE EVER SEEN IN THE INDUSTRY!"*

Thousands of engineers and programmers use MICROWARE software products as their standard time-saving tool . . . to execute process-control applications . . . and for other vital functions. COBOL and PASCAL are also available under the OS-9 operating system.

### HOW THIS REMARKABLE TEAM OF COMPUTER SUPERSTARS CAN SERVE YOU

SMOKE SIGNAL's Chieftain™ computer provides an array of configurations ranging from 5¼-inch drives for single-user applications to multi-user, multi-tasking capabilities. Winchester hard-disk drive systems are also available.

In other words, **breathhtaking power** with as little as 48k memory; Microware's OS-9 Level Two can access up to one full megabyte that your Chieftain™ can address!

One more sampling of the awesome processing potential at your fingertips with the Smoke Signal Chieftain™ computer:

MICROWARE'S Stylograph screen-oriented word processing package instantly makes Chieftain™ an easy-to-use document preparation system with comprehensive editing commands.

**THERE'S MUCH, MUCH MORE!** Call or write SMOKE SIGNAL for details on Chieftain™ computers and MICROWARE software.

**SMOKE SIGNAL Dealer opportunities are still available . . . please request information.**

- ☐ Send Information about Chieftain™ computers and Microware software.
- ☐ Provide information about Smoke Signal's Dealer program.

Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_  
Telephone ( \_\_\_\_\_ ) \_\_\_\_\_



# WHY YOU NEED THE INSPECTOR.

If you're serious about programming, you need to set all your utilities together in one place — *inside* your Apple. The Inspector comes on an Eprom that simply plugs into the D8 socket, or on a disk ready to merge with Integer Basic for automatic loading on boot. Either way, it stays at your fingertips, ready to call without disturbing your current program.

The Inspector puts you in total control of both memory and disks. You can search forward and backwards, edit, read nibbles, map disk space, dump the screen to a printer, examine every secret of your Apple. Use The Inspector to repair blown disks, undelete files, input "illegal" commands,

read and alter files, locate strings in memory or on disk. The uses are endless. The manual, alone, is an education. And it's always *there* when you need it.

You need the most powerful disk and memory utility available for your Apple. You need the Inspector.

See your local dealer, or order direct for just \$49.95. Mastercard and Visa holders order toll-free, 1-800-835-2246.



**OMEGA MICROWARE, INC.**  
222 SO. RIVERSIDE PLAZA  
CHICAGO, IL 60606  
312-648-1944

Apple is a registered trademark of Apple Computer, Inc.

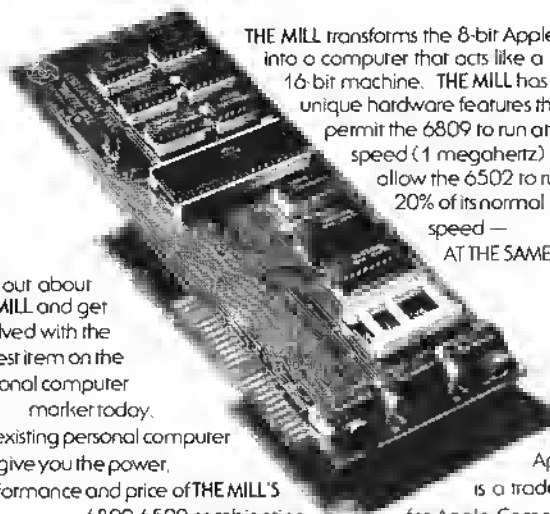
# Your Apple too slow? Not anymore...

Now you too can write 6809 programs for your Apple II that are DOS 3.3 comparable. But you don't have to stop there, you can also program your Apple II's 6502 and the 6809 of THE MILL to run SIMULTANEOUSLY.

THE ASSEMBLER DEVELOPMENT KIT, including THE MILL, is a full feature assembler, designed to use the text editing system of your choice. The system will also boost your computer programming productivity, since the 6809 is today's easy to learn and program computer. Take advantage of the 8-bit 6502 and the 16-bit abilities of the 6809 running at the same time, create your own MULTIPROCESSING ENVIRONMENT on the Apple II.

Put THE MILL into your Apple II and get power, performance and price matched by no other personal computer. STELLATION TWO offers a full 1 year warranty and a 60 day money back guarantee, if you're not completely satisfied with the power of THE MILL.

Shop around, then compare the service, quality, price and power of THE MILL. Take this ad to your local Apple Dealer and see the endless possibilities of adding THE MILL to your Apple II.

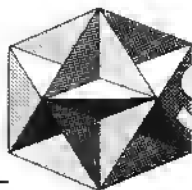


THE MILL transforms the 8-bit Apple II into a computer that acts like a 16-bit machine. THE MILL has unique hardware features that permit the 6809 to run at full speed (1 megahertz) and allow the 6502 to run at 20% of its normal speed —  
**AT THE SAME TIME!**

Find out about THE MILL and get involved with the hottest item on the personal computer market today.

No existing personal computer can give you the power, performance and price of THE MILL'S 6809-6502 combination.

Apple II is a trademark for Apple Computer, Inc.



**STELLATION  
TWO**

P.O. BOX 2342 - N6  
SANTA BARBARA, CA. 93120  
(805) 966-1140

# MICRO

## From Here to Atari

James Capparelli  
297 Missouri  
San Francisco, California 94107

Last month I showed you how to use the Load Memory Scan (LMS) instruction of the display list to effect a scrolling screen. Recall that the display list is the set of instructions used to control an LSI chip called ANTIC. ANTIC, a dumb microprocessor, functions as a graphics controller. Its principle functions are to specify the location in memory to be displayed, the mode of display (14 graphics/text modes with differing resolutions to choose from), horizontal/vertical scroll enable (discussed last month) and display list instruction interrupt enable.

This month I've included an ANTIC disassembler. This program requires you to enter a BASIC graphics mode numbered 0 - 8, and will then locate the associated display list and decode the instructions. Note that this

program prints the ANTIC display modes numbered 2 - 15. Use the program and the ANTIC/BASIC correspondences will become apparent. (See program 1.) I also want to take you on a short trip into the world of basic raster scan graphics, Atari style, and then provide a quick lesson in the use of display list interrupts.

The normal NTSC raster television is made up of 625 interlaced scan lines. These scan lines are the horizontal lines appearing in the picture tube phosphor when energized by the electron beam as it sweeps left to right, top to bottom, across your screen. Interlacing occurs in normal television to eliminate flicker. It simply means that all even scan line rows are "painted" in one frame, and all odd lines in the next. The frame refresh rate is 60 Hz.

Each Atari frame image contains 262 scan lines with no interlacing. Every frame is the duplicate of the prior one unless there is programmer intervention. The image is repainted 60 times per second, and the electron

beam is turned off at the end of every scan line. At that time it is returned to the left edge of the screen to start the next line trace. This is called horizontal blank time.

The beam is also turned off after every frame so that it may return to top left corner of the screen, called vertical blank time. These two time periods are very important to the would-be animator. It is crucial to understand how much time is available and how to enter code such that it will be executed at the appropriate moment.

The 6502 microchip in the Atari cycles at 1.79 megahertz, almost twice as fast as the normal 6502. This cycle rate was chosen so that two color clock widths on a scan line equal one machine cycle. There are 228 color clocks on every scan line, and the maximum displayable width of any scan line is 176 color clocks, called "wide playfield" in the Atari literature. The maximum resolution is  $\frac{1}{2}$  color clock, and therefore Atari can display up to 352 picture elements (pixels) horizontally. The maximum vertical resolution, in scan line units is 240. Effectively, Atari has a high-resolution mode of  $352 \times 240$ .

It's important to realize that there are physical limitations to this size display. Depending on your television's adjustment, some of the displayed image may appear on the curved edge of the picture tube. This overlap is called overscan. While overscan is not important in normal television viewing, it is crucial when your word processor is printing what you can't see.

Atari, in its Operating System (O.S.), used a more conservative screen size of 320 (160 clocks) horizontally by 192 scan lines vertically. This width screen is called normal playfield in the documentation. In this way Atari defeated normal overscan and assured us of seeing an entire image. There is a narrow playfield width as well, 256 pixels (128 clocks wide). These dimensions and timing are important since what is not used at display time is left over and available at interrupt time. (See table 1 for timing.)

It is relatively simple to change between screen widths. Location \$22F  
(Continued on page 46)

**Table 1: Timing**

1.79 MHZ machine cycle  
262 scan lines per frame  
228 color clocks per scan line  
60 frames per second refresh rate

$1.79/60 = 29868$  machine cycles per frame  
 $29868/262 = 114$  machine cycles per scan line  
 $228/114 = 2$  color clocks per machine cycle

### Vertical Blank Time

262 scan lines - 192 displayed scan line = 70  
 $70 \times 114$  cycles/line = 7980 cycles available\*

### Horizontal Blank Time

#### Wide Playfield

228 clocks - 192 clocks = 36 clocks  
 $36/2 = 18$  machine cycles

#### Normal Playfield

228 clocks - 160 clocks = 68 clocks  
 $68/2 = 34$  machine cycles

#### Narrow Playfield

228 clocks - 128 clocks = 100 clocks  
 $100/2 = 50$  machine cycles

\*All graphics are cycle-stealing Direct Memory Access (DMA). Depending on graphics mode and memory refresh, this value will be less.

**bonus!**

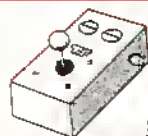
**FREE  
THUNDERBIRDS-GX  
game disk enclosed**

## GET FREE space game disk with order

With any purchase of the product listed here except software, you will receive one free THUNDERBIRDS-GX diskette. THUNDERBIRDS-GX: High-speed, High-resolution Space shooting game for Apple-II, Apple-II Plus with Disk-II (13 or 16 sector)

Super joystick for Apple-II! Telephone style keypad provides you extra programmable keys. Comes with graphics software.

**FANTA Stick I** ~~\$125.00~~ \$99.00



Easy to use for both of one or two handed operation. High resolution and durable joystick is ideal for games and other applications.

~~\$39.95~~ **Robostick I** \$30.00



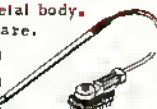
**Atari joystick** \$9.00

Atari joystick is adapted to Apple! This set is ideal for direction control for games and screen plotter.

**Apple interface** \$20.00

**Light pen** Neat construction with metal body. Comes with control software.

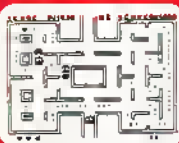
Apple-II ~~\$29.95~~ \$25.00  
PET, CBM\* ~~\$44.95~~ \$25.00  
TRS-80 ml\* ~~\$44.95~~ \$25.00



**RAM Board for Apple** ~~\$125.00~~ \$125.00

No more cable for your Apple Memory Board! On-board refresh circuit made this board independent from Apple's refresh signal. You need not pull out RAM from Apple-II to install the cable.

**4116 (200ns) RAM** 8 for \$15.00

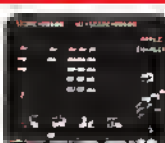


**HUNGRY BOY**

Chase in the maze in color!

**GAME  
for Apple**

\$23.00 each



**COSMO MISSION**

Most popular Apple game!

\* Marked items are limited in quantity.

We mail the acceptance with expected shipping date on it. Contact us if you do not hear from us in 10 working days. Add \$2 for each shipping. California resident add 6% tax. COD for money order or cashiers check only. Allow 2-3 weeks for the order with personal check.

**COSMOS™ ASTAR INTERNATIONAL Co.**  
5676 FRANCIS AVE., CHINO, CA 91710 714-627-9887

Apple-II is a registered trademark of Apple Computer, Inc.

# ABBS 4.0

*It was worth the wait!*

The original Apple Bulletin Board System™ is now the ultimate personal message system.

Compatible with many large disk systems and Disk II.

Add-on modules for customization.

for data is contact



**Software Sorcery, Inc.**  
7927 Jones Branch Dr. 400  
Mc Lean, VA 22102  
(703) 385-2944

See for yourself! Dial  
(703) 255-2192

## ED-SCI STATISTICS

FOR THE PROFESSIONAL A COMPLETE STATISTICS AND DATA MANAGEMENT PACKAGE

- |   |   |
|---|---|
| <b>Data Entry and Filing</b> <ul style="list-style-type: none"> <li>• By Variable Name and Case Number</li> <li>• One-Time Data Entry</li> <li>• Easy and Rapid Editing</li> <li>• Data Entry Worksheets</li> </ul>                     | <b>Statistical Calculations</b> <ul style="list-style-type: none"> <li>• Mean, Std. Dev., Std. Error</li> <li>• Coefficient of Variation</li> <li>• Frequency Distribution</li> <li>• Unpaired t-Test</li> <li>• Paired t-Test</li> <li>• Mann-Whitney U Test</li> <li>• Wilcoxon Paired Sample Test</li> <li>• Chi-Square Test</li> <li>• Linear Regression</li> <li>• Correlation</li> <li>• One-Way ANOVA with the Newman-Keuls Test</li> <li>• Hard Copy of Data &amp; Results</li> </ul> |
| <b>Data File Manipulation</b> <ul style="list-style-type: none"> <li>• Add New Variables</li> <li>• Add or Delete Case Values</li> <li>• Create SUBFILES By User Defined SEARCH &amp; SELECT Criteria</li> <li>• Merge Files</li> </ul> |   |

Statistical Calculations can be made on **VISICALC\*** (DIF) and **DATADEX\*** FILES. Graphic Plotting of all **ED-SCI STATISTICS** Data Files can be done with **APPLE PLOT\***

Only \$95.00 brings you the **ED-SCI STATISTICS** instruction manual, the Master Program Disk, and a Back-Up Disk.

See **ED-SCI STATISTICS** at your local Apple Computer store. Dealer inquiries invited. For information please phone or write:

**Ed-Sci Development**

460 Beacon St. San Francisco, CA 94131 (415) 282-7020

**ED-SCI STATISTICS** requires an Apple II with the Applesoft or Language Card, or an Apple II+, 48K memory, and at least one disk drive with DOS 3.3 (16 sector).

\*Apple is a registered trademark of Apple Computer, Inc. VisiCalc is a registered trademark of Personal Software, Inc. DATADEX is a registered trademark of Sonoma Software.

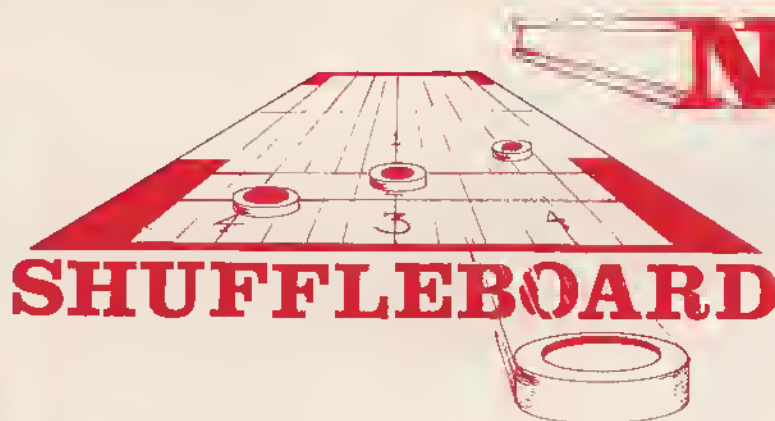
**Innovative Design Software, Inc.**

ANNOUNCES

**SHUFFLEBOARD**

for your APPLE II.™

only \$29.95



**NEW**

- Real time  
HIRES Color  
Graphics

- Play Against  
your APPLE or  
another opponent

- An accurate and  
challenging game  
following in the  
tradition of Pool 1.5

**POOL 1.5 features**

- Realistic, life-like motion
- HIRES Color Graphics
- Choice of 4 popular pool Games
- You've Got to see it to believe it!
- Only \$34.95

— Another first from IDSI



"IT (Pool 1.5) is so realistic, you begin filling in the details of the pool hall yourself"

— Softalk Magazine

Both of these excellent games require a 48K APPLE II/Plus and a DISK II. Pool 1.5 requires a set of game paddles or Joystick. Order directly from IDSI or see your nearest APPLE dealer.

**IDSI**

P.O. BOX 1658  
Las Cruces N.M. 88004  
(505) 522-7373

- Apple II/Plus is  
a Trademark  
of Apple Computer Inc.  
Pool 1.5 is a trademark  
of IDSI



We accept  
Visa, MasterCard,  
Check or Money Order.

(Continued from page 43)

controls playfield width. Called SDMCTL in the documentation, it is initialized to \$22. Writing a \$23 will change the screen dimension to wide, and writing \$21 will reduce the screen to narrow. SDMCTL is the O.S. shadow for a hardware register in the ANTIC chip at \$D400, called DMACTL.

Since many of these hardware locations are write only, the O.S. keeps copies, called shadows, in RAM. Shadow registers update the associated hardware at Vertical Blank Interrupt time. Remember to use the shadows to effect a permanent change to the entire frame. The exception occurs when using

a display list interrupt. These interrupts can occur, under programmer control, on any scan line of every frame. To effect an immediate change at scan line interrupt, you must write directly to the hardware register.

To use the Display List Interrupt (DLI), a number of things must be accomplished. First, write the DLI service routine. The important thing to

```
10 REM *** PROG1 ***
20 REM MEMORY AND DISPLAY LIST VARIES WITH GRAPHICS MODE
30 REM DUMP AND DISASSEMBLE DISPLAY LIST
40 REM
100 ? " INPUT GRAPHICS MODE "; INPUT MODE
105 GRAPHICS MODE
110 LST=PEEK(560)+PEEK(561)*256:REM FIND START OF DISPLAY LIST
120 MEMRY=PEEK(LST+4)+PEEK(LST+5)*256:REM FIND START OF DISPLAY MEM.
130 RAMTOP=PEEK(106)*256:REM NUMBER OF PAGES IN MEM DEFINED AT POWER ON
140 REM LIST
150 LPRINT " OS GRAPHICS MODE ";MODE
160 LPRINT " RAM AVAILABLE AT POWER ON ";RAMTOP
170 LPRINT " START OF DISPLAY LIST ";LST
180 LPRINT " START OF DISPLAY MEMORY ";MEMRY
190 REM DUMP DISPLAY LIST WITH DISASSEMBLY OF INSTRUCTIONS
195 LMS=64:INT=128:HSCRL=16:VSCRL=32:JVB=65:JMP=1
200 FOR I=LST TO MEMRY-1
205 LPRINT I;" ";PEEK(I);
210 INST=PEEK(I):REM DISPLAY LIST VALUE
215 IF INST>=128 THEN GOSUB 1100:GOTO 400
220 GOSUB 1140
400 NEXT I
410 STOP
1100 INST=INST-INT:REM GET RID OF INTERRUPT BIT
1105 LPRINT " INSTRUCTION INTERRUPT ENABLE "
1140 GOSUB 2000:REM FIND JUMPS AND BLANKS
1150 IF INST=0 THEN RETURN
1160 GOSUB 1400:REM GO FIND LMS
1170 GOSUB 1500:REM GO FIND VSCROL
1180 GOSUB 1600:REM GO FIND HORIZONTAL SCROLL
1190 GOSUB 1700:REM TRANSLATE ANTIC MODE TO OS GRAPHICS MODE
1200 RETURN
1400 IF INST<66 THEN RETURN :REM NO LMS
1405 LPRINT " LOAD MEM SCAN FROM ";PEEK(I+1)+PEEK(I+2)*256
1410 INST=INST-LMS:REM GET RID OF LMS BIT.
1420 I=I+2:REM INCREMENT LOOP AROUND ADDRESS BYTES
1430 RETURN
1500 IF INST<34 THEN RETURN :REM NO VSCROL ENABLE
1510 INST=INST-VSCRL:REM GET RID OF VSCROLL BIT
1520 LPRINT " VERTICAL SCROLL ENABLED "
1530 RETURN
1600 IF INST<18 THEN RETURN :REM NO HSCROLL ENABLE
1610 INST=INST-HSCRL:REM GET RID OF HORIZONTAL SCROLL BIT
1620 LPRINT " HORIZONTAL SCROLL ENABLED "
1630 RETURN
1700 LPRINT " ANTIC DISPLAY MODE ";INST
1750 RETURN
2000 IF INST=0 OR INST=16 OR INST=32 OR INST=48 OR INST=64 OR INST=80 OR INST=96 OR INST=112 THEN G
OSUB 2100
2010 IF INST=1 THEN GOSUB 2200
2020 IF INST=65 THEN GOSUB 2300
2030 RETURN
2100 LPRINT " BLANK ";INT(INST/16)+1;" LINES"
2110 INST=0:RETURN
2120 REM
2200 LPRINT " JUMP INSTRUCTION TO ";PEEK(I+1)+PEEK(I+2)*256
2210 I=I+2:REM INCREMENT AROUND ADDRESS BYTES
2215 INST=INST-JMP:RETURN
2220 REM
2300 LPRINT " JUMP & WAIT FOR VERTICAL BLANK TO ";PEEK(I+1)+PEEK(I+2)*256
2310 I=I+2:REM INCREMENT AROUND ADDRESS BYTES
2315 INST=INST-JVB:RETURN
```



remember here is to save and restore any registers needed by the routine. Then find a free place in memory for this routine. (As you know, Atari has reserved page six, decimal 1536, just for users.) Next, update the vector at \$200 and \$201 to point to start of the routine. Now change the appropriate display list instruction to cause an interrupt (accomplished by turning on bit 7 of the instruction). Finally, enable DLIs by setting bit seven of hardware register \$D40E, called NMIEEN (Non-Maskable Interrupt enable). See program 2 for a simple example.

Also remember to set the interrupt in the mode line prior to the location where you would have the changes occur. Then write to a location called WSYNC \$D40A. This will cause any changes to be delayed to the start of the next scan line and, therefore, allow a smooth synchronized transition.

DLIs can be used for everything from putting many colors on the screen, to changing among a number of character sets, to moving player/missiles around. To get the most from Atari, experiment with this concept.

```

10 REM *** PROGRAM 2 ***
20 REM THIS WILL CREATE A DISPLAY LIST WITH DLI ENABLED
30 REM THE SCREEN WIDTH IS NARROWED AT DLI TIME AS WELL
40 REM
45 GRAPHICS 0:SETCOLOR 4,4,9:REM SET BORDER COLOR
50 DLST=PEEK(560)+PEEK(561)*256:REM FIND START OF DISPLAY LIST
60 POKE DLST+14,PEEK(DLST+14)+128:REM TURN ON INTERRUPT BIT 7
70 FOR L=0 TO 29:REM POKE DLI SERVICE ROUTINE INTO PAGE 6
80 READ INSTRUCT:POKE 1536+L,INSTRUCT
90 NEXT L
100 DATA 72,138,72,169,40,162,48,141,10,212,141,23,208
110 DATA 142,24,208,169,33,141,0,212,162,140,142,26,208,104,170,104,64
120 POKE 512,0:POKE 513,6:REM POINT TO DLI INTERRUPT SERVICE ROUTINE
130 POKE 54286,192:REM ENABLE DLI
140 LIST
150 REM *** DLI SERVICE ROUTINE ***
152 REM PHA      SAVE REGISTERS
154 REM TXA
156 REM PHA
158 REM LDA #28 CHARACTER LUMINENCE
160 REM LDX #30 BACKGROUND COLOR
162 REM STA $D40A WAIT FOR HORIZONTAL SYNCH
164 REM STA $D017 PLAYFIELD 1
166 REM STX $D018 PLAYFIELD 2
168 REM LDA #21 NARROW PLAYFIELD
170 REM STA $D400 DMACTL ENABLE NARROW WIDTH
172 REM LDX #8C BORDER COLOR
174 REM STX $D01A COLBK
176 REM PLA      RESTORE REGISTERS
178 REM TAX
180 REM PLA
182 REM RTI      RETURN FROM INTERRUPT

```

MICRO

## DUAL DOS ROMS FOR APPLE II\*

WITH

MOUNTAIN COMPUTER'S **\*ROMPLUS\*** OR ANDROMEDA'S **\*ROMBOARD\***

### SWITCH FROM ONE DOS (3.2 or 3.3) TO THE OTHER WITHOUT BOOTING

DUAL DOS ROMS - No gadgets or unsightly switches hanging from your disk controller, no software to run, no memory space used to store the other DOS, does not need the use of the 3.2 Proms (for those of you who purchased a disk drive with 3.3 DOS). Utilizes the standard 3.2 1 and 3.3 DOS, no special software (Multin/Demultin) to move your programs to and from 13 and 16 sector disks, no system pointers are changed, and is unaffected by any DOS commands. This invaluable utility is contained in two ROMs, which when plugged into MC's Romplus or the Andromeda ROMBoard, will be permanently imbedded in your Apple's memory and waiting for instant access. The length of time it takes the Apple to perform a carriage return is about how fast it takes to switch from one DOS to the other. Both ROMs have their own intelligence which allows one ROM to find the other, in order for them to toggle between either DOS. Either ROM can be initialized first. If the 3.2 ROM is initialized first the Applesoft Ampersand command can be used to toggle or flip from one DOS to the other. On the other hand, if you wish to preserve the existing Ampersand command vectors, the 3.3 ROM can be initialized first. The toggle or flip between DOS can then be accomplished by a simple CALL command from either Basic or Direct from the Monitor. Any program that is in memory will not be affected by the flip between DOS. The flexibility of toggling either DOS lends itself very easily to be done directly from within your own programs. Diskettes can be initialized from either DOS and 13 sector disks will have the faster INIT routine as part of its DOS. DUAL DOS ROMS are not recommended for use with disk drives that are configured with 3.2 Proms. Will operate with FP, INT, or LC and requires 48K, DOS 3.3, and MC's Romplus or Andromeda's ROMBoard.

(Two ROM Set) **\$54.95**

MT. COMPUTER'S ROMPLUS BOARD WITH ONE ROM **\$175.00** ANDROMEDA'S ROMBOARD WITH ONE ROM **\$125.00** SELECT ONE ROM FROM BELOW (ADD \$26.00 FOR DUAL DOS ROMS)

OTHER ROMS AVAILABLE: All ROMs are compatible with MC's Romplus or Andromeda's ROM Board.)

• FP RENUMBER/MERGE ROM - Apple Computer's infamous renumber program	<b>\$39.95</b>
• BASICS ROM - Will boot standard, special, and dedicated 13 sector disks	<b>\$39.95</b>
• FP EDITROM - Global search, change, and remove. (Works jointly with PLE)	<b>\$39.95</b>
• COMMAND ROM - Catalog Command Menu and Disk Map	<b>\$39.95</b>
• DISK COPY/SPACE ROM - Duplicates 13 or 16 Sector Disks	<b>\$39.95</b>
• FP UTILITY ROM - Auto Line Numbering, LIST CTRL, RESURRECT KILLED PROG., Alphabetize DISK CAT., Expung DOS	<b>\$39.95</b>

(Check or M.O.) Visa or MasterCard Accepted

**SOFT CTRL SYSTEMS, BOX 599, WEST MILFORD, NJ 07480 201-728-8750**

\* REGISTERED TRADEMARK  
ALL FIRMWARE IS COPYRIGHTED



Introducing the **M** line . . .

## Now! Drive Systems for AIM, KIM and SYM Computers — from PERCOM.

**Assembled and tested systems start at only \$599.95, including the drive controller circuit card, disk-operating system, interconnecting cable, drive and comprehensive users manual.**

- **The right storage capacity** — Available in 1-, 2- and 3-drive systems, with either 40- or 80-track drives.
- **Flippy storage** — Flippy drives (optional) let you flip a diskette and store data and programs on the second recording surface.
- **High Storage Capacity** — Formatted, one-side storage capacity is 102 Kbytes (40-track drive), 205 Kbytes (80-track drive).
- **Proven Controller** — The drive controller design is the same as the design used in the Percom 680X LFD mini-disk system. This system — introduced in 1977 — has given reliable service in thousands of applications. Two versions are available: the MFD-C65 for the AIM-65 expansion bus, and the MFD-C50 for the System-50 (SS-50) bus.
  - Includes an explicit data separator circuit that's reliable even at the highest bit densities.
  - Provides for on-card firmware.
  - Includes a motor inactivity time-out circuit.
  - Capable of handling up to four drives.
  - Capable of reading both hard- and soft-sectored diskettes.



PERCOM DATA COMPANY, INC.  
11220 PAGEMILL RD. DALLAS, TX 75243  
(214) 340-7081

Toll-Free Order Number: **1-800-527-1222**

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

© 1981 PERCOM DATA COMPANY, Inc.  
PERCOM, MFD-C50, MFD-C65 and M65/50 are trademarks of Percom Data Company, Inc.  
AIM-65 is a trademark of Rockwell International, Inc.  
KIM is a trademark of MOS Technology Corporation  
SYM is a trademark of Syntek, Inc.

- **DOS included** — The MFD disk-operating system works with the AIM monitor, editor, assembler, Basic and PL/65 programs, interface is direct, through user I/O and F1, F2 keys. Diskette includes DOS source code and library of 20 utility commands.
- **Reliability assurance** — Drives are burned-in 48 hours, under operating conditions, to flag and remove any units with latent defects.
- **Full documentation** — Comprehensive hardware and software manuals are included with each system.

### Now! Expand your AIM-65 with Low-cost System-50 Modules.

The Percom M65/50 Interface Adapter connects your M-65 bus to Percom's System-50 (SS-50) motherboard, allowing you to expand your AIM, KIM or SYM with proven System-50 modules. You can add disk storage, memory modules, even a video display system. The M65/50 provides buffer-amplification of address, data and control lines. On-card decode circuitry lets you allocate address space either to the computer or to the expansion motherboard. Price: only \$89.95, including System-50 motherboard.

**System Requirements:** AIM-65, KIM or SYM computer with expansion bus and four Kbytes RAM (min).

Yes . . . I'd like to know more about Percom MFD drive systems.  
Rush me free literature.

Send to  
**PERCOM DATA COMPANY, Inc., Dept. 65-M**  
11220 Pagemill Rd. Dallas, TX 75243

name \_\_\_\_\_  
address \_\_\_\_\_  
city \_\_\_\_\_ state \_\_\_\_\_  
zip \_\_\_\_\_ phone number \_\_\_\_\_

**MAIL TODAY!**

# Some Help for KIM

## Part 2

**Last month we saw how the KIM memory dump routine could be improved to provide a program format memory dump routine. This month we will continue our improvements to KIM by investigating the operation of the Single Step feature. Next month we will investigate improving the features of the Single Step routines.**

Wayne D. Smith  
Math/Computer Science Dept.  
Austin Peay State University  
Clarksville, Tennessee 37040

The single-step mode on the KIM can be very useful in determining where an erroneous program is malfunctioning. When KIM is in the single-step mode, one instruction is executed each time the letter G is depressed on the terminal. After the step is executed, KIM prints the address of the next instruction to be executed, and the operation code at that address. KIM then awaits another letter G key-press before executing the next step.

This mode of operation can be a great help to the user, but unfortunately, it does not always provide enough information for complete analysis of program operation. For example, the operand associated with the instruction about to be executed isn't shown. A user can single-step through a program several times before he discovers that all the operation codes are correct, but that one of the addresses is wrong.

Even the operation code and the operand are often not sufficient to pinpoint the error. It would also be beneficial to be able to determine the contents of the registers, the stack pointer

and the status flags. This information is available to the user, but he must first remember when KIM stores this information, and then print these locations one at a time. It would be much more convenient if the single-step software would print all this information for the user after each step were executed.

To write a single-step program, however, it is first necessary to understand how the KIM single-step feature operates. In essence, whenever an instruction is fetched and the single-step switch is on, a non-maskable interrupt is generated. This interrupt is generated by the sync signal from the 6502, which goes high only when an instruction fetch is taking place. This signal remains low for all other memory access operations.

The non-maskable interrupt input to the 6502 is an edge-triggered signal. That is, this pin is sensitive only to a high to low transition of the input signal. This means that the interrupt is not generated until the sync signal goes high and then low again. When this signal goes low, however, the instruction fetch is already in progress. Therefore, the interrupt is not honored until the current instruction has been fetched and executed. After instruction execution has been completed, the interrupt is honored, and the normal interrupt sequence is entered. The program counter and status register are pushed onto the stack. An indirect jump is then executed to the address stored in the NMI vector address (\$17FA and \$17FB on an unexpanded KIM). Normally, this is a jump to location 1C00.

The software located at 1C00 takes care of storing the registers, the program counter, the stack pointer and the status register in predetermined page zero addresses. After printing a carriage return and a line feed, KIM then prints the address of the next instruction and the value stored at that address. This is relatively easy, since the program counter that was stored earlier is pointing to

that address. KIM then goes into a loop awaiting a new key-press.

But, the question arises as to how the software located at 1C00 should be executed without generating additional interrupts whenever an instruction fetch takes place. This problem is eliminated by NANDing the sync signal with the K7 signal and using this output to generate the interrupt. In this manner, an interrupt will only take place if an instruction fetch takes place to an address which is outside K7. If the K7 signal is low, the interrupt gate is effectively disabled. This means that any of the KIM software located in the ROM address space K7 may be executed without generating interrupts. This is very convenient. Not only is the single-step software located in K7, but most of the other KIM routines, except the tape input and output programs, are also located here. This point does raise a minor problem because it is not possible to single-step any program which is located in K7. This presents no real difficulty, however, since I have yet to find a programming error in the KIM software.

Now, if the user wishes to write an improved single-step routine, it will not work if it is located outside the K7 address space. In fact, if this is attempted, an infinite loop of interrupts will be generated as the interrupt causes a branch to a location, which generates an interrupt which causes a branch to ..., etc.

Therefore, to use a modified single-step program, there are two possible alternatives. The first alternative is to locate the new program in K7. This is clearly impossible, since K7 is not only ROM, but all 1024 locations are already in use by the KIM software. The only other alternative is to make a minor hardware modification to the KIM itself so that programs in some other area will not generate the NMI signal when instructions are fetched from this area.

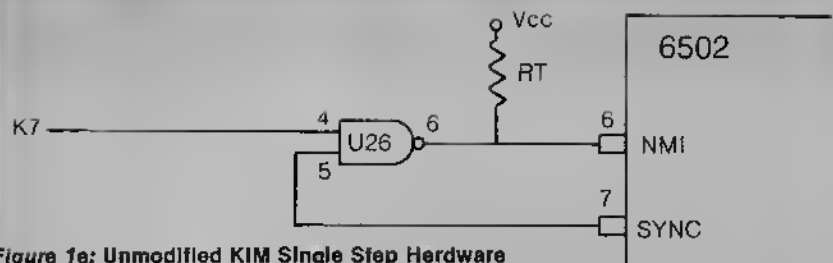


Figure 1a: Unmodified KIM Single Step Hardware

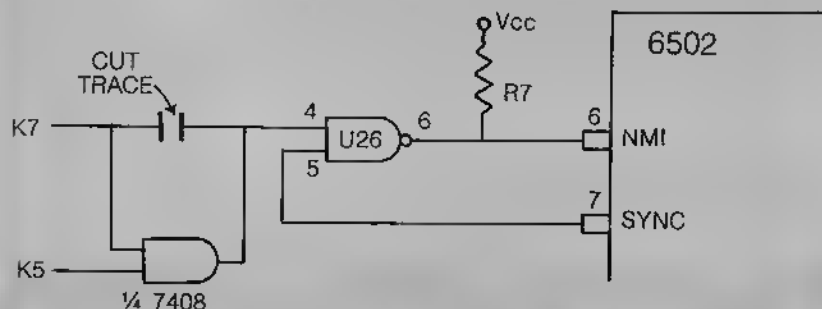


Figure 1b: Modified Hardware for Single Step Program Located In K5

Figure 1a shows the hardware associated with the KIM single-step interrupt generator. To prevent generating an interrupt in an area other than K7, it is necessary to AND the K7 signal with the K signal for that area of memory. Notice that it would not be wise to

replace the K7 signal with the new signal, since this would make all the KIM routines in K7 run in single-step mode. Since the terminal I/O routines would probably be needed for any single-step program, this approach is impractical.

Figure 1b shows the added gate which allows location of the single-step program in either K7 or K5. In my case, K5 was chosen because the 128 bytes of RAM located in this area are just enough for the single-step program, but too small for anything else. In addition, I also use area K5 for all my I/O ports, and hence, have no additional RAM located here. Access to an I/O port will not generate a fetch (sync) signal, therefore K5 is an ideal area for my system.

If you prefer to locate the single-step program somewhere else, you may do so by substituting the appropriate K signal for K5. This will definitely become necessary if you are using a TVT-6, which utilizes the 128 bytes of K5 RAM to generate video displays. The single-step program itself is easily relocated, but remember, if you move it to another area, no program which is stored in that entire 1K area can be single-stepped.

Next month we will look at some variations on the hardware modifications, and also examine the software needed to provide an improved single-step capability.

**MICRO**

## PERRY PERIPHERALS REPAIRS KIMs!! (SYM and AIMs Too)

- We will Diagnose, Repair, and Completely Test your Single Board Computer
- We Socket all replaced Integrated Circuits
- You receive a 30-day Parts and Labor Warranty
- Labor is \$38.00 if 40-pin ICs are socketed (\$40.00 otherwise) — Parts Extra
- Your repaired S.B.C. returned via U.P.S. — C.O.D., Cash

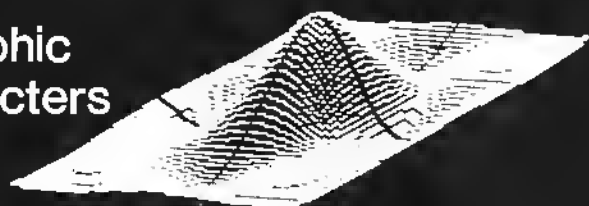
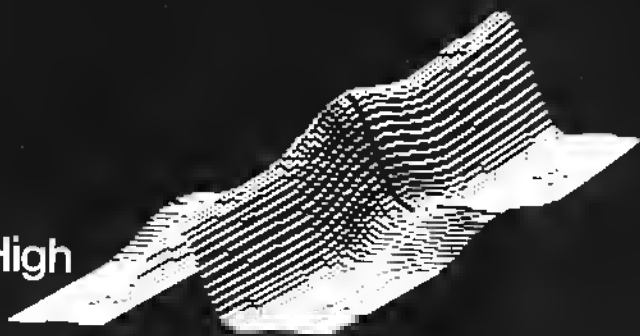
Don't delay! Send us your S.B.C. for repair today  
Ship To: (Preferably via U.P.S.)

**PERRY PERIPHERALS**  
6 Brookhaven Drive  
Rocky Point, NY 11778

*Perry Peripherals carries a full line of the acclaimed HDE expansion components for your KIM, SYM, and AIM, including RAM boards, Disk Systems and Software like HDE Disk BASIC V1.1. Yes, we also have diskettes. For more information, write to: P.O. Box 924, Miller Place, NY 11764 or Phone (516) 744-6462.*

# GRAPHICS FOR OSI COMPUTERS

- ☆ You Can Produce The Images Shown Or Yours And Program Motion With Our 256 By 256 High Resolution Graphics Kit. Thats 65,536 Individually Controlled Points On Your TV Screen.
- ☆ Increase Column/Line Display. You Can Set Up Your Own Graphic Pixels Including Keyboard Characters And Unlimited Figures.
- ☆ This Kit Includes All Parts, Software And Assembly Instructions Required To Get Up And Running. The Included 8k Of 2114 Memory Is Automatically Available When Not Using The Graphics. Boot Up And See 8k More Memory.
- ☆ Adding The Kit Does Not Affect Your Existing OSI Graphics. Use Both At The Same Time Or Separately.
- ☆ Buy The Entire Kit, Including Memory, For \$185.00 Or A Partial Kit For Less If You Have Parts. Board And Instructions \$40.00. Instructions Include Software.



For This Kit Or A Catalog  
Of Other Kits, Software  
And Manuals Call Or Write:

MITTENDORF ENGINEERING  
905 Villa Nueva Dr.  
Litchfield Park, Az. 85340  
(602)-935-9734



**GALAXIAN** - 4K - One of the fastest and finest arcade games ever written for the OSI, this one features rows of hard-hitting evasive dogfighting aliens thirsty for your blood. For those who loved (and tired of) Alien Invaders. Specify system - A bargain at \$9.95 OSI

**LABYRINTH** - 8K - This has a display background similar to MINOS as the action takes place in a realistic maze seen from ground level. This is, however, a real time monster hunt as you track down and shoot mobile monsters on foot. Checking out and testing this one was the most fun I've had in years! - \$13.95. OSI

### THE AARDVARK JOURNAL

**FOR OSI USERS** - This is a bi-monthly tutorial journal running only articles about OSI systems. Every issue contains programs customized for OSI, tutorials on how to use and modify the system, and reviews of OSI related products. In the last two years we have run articles like these!

- 1) A tutorial on Machine Code for BASIC programmers.
- 2) Complete listings of two word processors for BASIC IN ROM machines.
- 3) Moving the Directory off track 12.
- 4) Listings for 20 game programs for the OSI.
- 5) How to write high speed BASIC - and lots more -

Vol. 1 (1980) 6 back issues - \$9.00

Vol. 2 (1981) 4 back issues and subscription for 2 additional issues - \$9.00.

### ADVENTURES!!!

For OSI, TRS-80, and COLOR-80. These Adventures are written in BASIC, are full featured, last action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch".)

Adventures require 8K on an OSI and 16K on COLOR-80 and TRS-80. They sell for \$14.95 each.

### ESCAPE FROM MARS (by Rodger Olsen)

This ADVENTURE takes place on the RED PLANT. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

### PYRAMID (by Rodger Olsen)

This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

### TREK ADVENTURE (by Bob Retelle)

This one takes place aboard a familiar starship. The crew has left for good reasons - but they forgot to take you, and now you are in deep trouble.

### DEATH SHIP (by Rodger Olsen)

Our first and original ADVENTURE, this one takes place aboard a cruise ship - but it ain't the Love Boat.

### VAMPIRE CASTLE (by Mike Bassman)

This is a contest between you and old Drac - and it's getting a little dark outside. \$14.95 each.

### NEW-NEW-NEW TINY COMPILER

The easy way to speed in your programs. The tiny compiler lets you write and debug your program in Basic and then automatically compiles a Machine Code version that runs from 50-150 times faster. The tiny compiler generates relocatable, native, transportable machine code that can be run on any 6502 system.

It does have some limitations. It is memory hungry - 8K is the minimum sized system that can run the Compiler. It also handles only a limited subset of Basic - about 20 keywords including FOR, NEXT, IF THEN, GOSUB, GOTO, RETURN, END, STOP, USR(X), PEEK, POKE, =, \*, /, <, >, Variable names A-Z, and Integer Numbers from 0-64K.

TINY COMPILER is written in Basic. It can be modified and augmented by the user. It comes with a 20 page manual.

TINY COMPILER - \$19.95 on tape or disk OSI

### SUPERDISK II

This disk contains a new BEXEC\* that boots up with a numbered directory and which allows creation, deletion and renaming of files without calling other programs. It also contains a slight modification to BASIC to allow 14 character file names.

The disk contains a disk manager that contains a disk packer, a hex/dec calculator and several other utilities.

It also has a full screen editor (in machine code on C2P/C4) that makes corrections a snap. We'll also toss in renumbering and program search programs - and sell the whole thing for

SUPERDISK II \$29.95 (5 1/4") OSI

### BARE BOARDS FOR OSI C1P

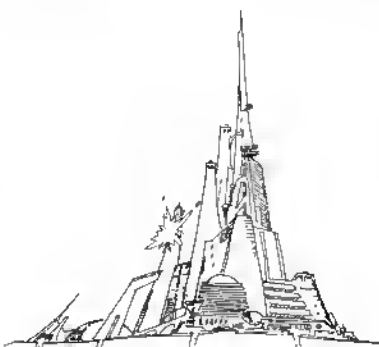
**MEMORY BOARDS!!!** - for the C1P - and they contain parallel ports!

Aardvarks new memory board supports BK of 2f14's and has provision for a PIA to give a parallel port! It sells as a bare board for \$29.95. When assembled, the board plugs into the expansion connector on the 600 board. Available now!

**PROM BURNER FOR THE C1P** - Burns single supply 2716's, Bare board - \$24.95.

**MOTHER BOARD** - Expand your expansion connector from one to five connectors or use it to adapt our C1P boards to your C4/8P. - \$14.95.

**16K RAM BOARD FOR C1P** - This one does not have a parallel port, but it does support 16K of 2f14's. Bare Board \$39.95.



**Please specify system on all orders**

This is only a partial listing of what we have to offer. We offer over 120 games, ROMs, and data sheets for OSI systems and many games and utilities for COLOR-80 and TRS-80. Send \$1.00 for our catalog.

**AARDVARK TECHNICAL SERVICES, LTD.**

**2352 S. Commerce, Walled Lake, MI 48088**

**(313) 669-3110**

### WORD PROCESSING THE EASY WAY - WITH MAXI-PROS

This is a line-oriented word processor designed for the office that doesn't want to send every new girl out for training in how to type a letter.

It has automatic right and left margin justification and lets you vary the width and margins during printing. It has automatic pagination and automatic page numbering. It will print any text single, double or tripla spaced and has text centering commands. It will make any number of multiple copies or chain files together to print an entire disk of data at one time.

MAXI-PROS has both global and line edit capability and the pollard keyboard versions contain a corrected keyboard routine that make the OSI keyboard decode as a standard typewriter keyboard.

MAXI-PROS also has sophisticated file capabilities. It can access a file for names and addresses, stop for inputs, and print form letters. It has file merging capabilities so that it can store and combine paragraphs and pages in any order.

Best of all, it is in BASIC (OS65D 51/4" or 8" disk) so that it can be easily adapted to any printer or printing job and so that it can be sold for a measly price.

MAXI-PROS - \$39.95. Specify 5 1/4" or 8" disk.

**SUPPORT ROMS FOR BASIC IN ROM MACHINES** - C1S/C2S. This ROM adds line edit functions, software selectable scroll windows, bell support, choice of OSI or standard keyboard routines, two callable screen clears, and software support for 32-64 characters per line video. Has one character command to switch model 2 C1P from 24 to 48 character line. When installed in C2 or C4 (C2S) requires installation of additional chip. C1P requires only a jumper change. - \$39.95

C1E/C2E similar to above but with extended machine code monitor. - \$59.95 OSI

### ARCADE GAMES FOR OSI, COLOR-80 AND TRS-80 (8K OSI, 16K TRS-80 AND COLOR-80)

**TIMETREK** - A REAL TIME, REAL GRAPHICS STARTREK. Sea your torpedoes hit and watch your instruments work in real time. No more unrealistic scrolling displays! \$14.95.

**STARFIGHTER** - This one man space war game pits you against spacecruisers, battlewagons, and one men fighters, you have the view from your cockpit window, a real time working instrument panel, and your wits. Another real time goody, \$9.95

**BATTLEFLEET** - This grown up version of Battleship is the toughest thinking game available on OSI or 80 computers. There is no luck involved as you seek out the computers hidden fleet. A topographical toughie. \$9.95

**QUEST** - A NEW IDEA IN ADVENTURE GAMES! Different from all the others, Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time. 16K COLOR-80 OR TRS-80 ONLY. \$14.95

# OSI Symbolic Disassembler

**This modification of Werner Kolbe's "Symbolic Disassembler" was written for OSI C4P. However, it should run, with few further modifications, on other OSI machines.**

David E. Pitts  
16011 Stonehaven Dr.  
Houston, Texas 77059

I was in the process of trying to understand BASIC on my OSI 4PMF and had already ordered the books on how Microsoft BASIC works, but wanted to know more. I thought that a good way to learn would be to disassemble parts of BASIC (located \$0200 to \$2300), so I booted the system, loaded the assembler/disassembler and proceeded to disassemble that region of RAM. While the computer was churning away I glanced in the OSI 4P hook to be sure that I was working on the correct region. Much to my dismay I noticed that \$200 to \$2300 was now occupied by the Assembler and Extended Monitor. Back at the drawing board, three choices came to mind: move the Assembler/Disassembler, move BASIC, or write a disassembler in BASIC. The first two choices would involve considerable work in changing absolute addresses and jumps, so a disassembler in BASIC seemed in order.

My disassembler was just coming to life when my son pointed out the PET symbolic disassembler in the January 1981 issue of MICRO [32:23]. Not being familiar with the dialect of BASIC used with the PET, I ignored his suggestion and continued on my program. A week later my disassembler was still giving OM (out of memory) errors after successfully disassembling about 6 lines of code — obviously due to a bug in the string usage, as there should have been plenty of the 48K of memory left. I was about ready to convert my string usage to the more efficient

techniques discussed by Edward Carlson in "A 6502 Assembler in BASIC," MICRO, [34:7], when my son once again suggested the PET disassembler program.

The next few hours involved reading Werner Kolbe's carefully documented article, and keying in the program. Some confusion occurred when I encountered "GET" and the symbols for "home", but logic suggested the former was an input from the keyboard and the latter was a key on the keyboard, so I proceeded on that assumption. It was unclear why I would need to open and close files (line 45), as Kolbe did on the PET, unless I needed to save all the disassembled code. Since I didn't think that this was the case, I gambled that this was just a peculiar aspect of PET BASIC and removed the "OPEN", "CLOSE", and

converted "PRINT#1" to "PRINT" in all the statements.

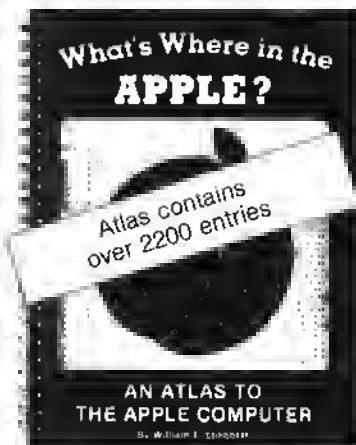
*Editor's Note: Files were used in Kolbe's program to make it easy to switch between screen and printer. The PET screen is treated as an IEEE-488 device (3), just like the printer, so the save file number (1, in this case) can be used in the PRINT# statements. The only difference is in the device number when the file is opened.*

Table 1 lists the line numbers and the changes that were made to convert to OSI BASIC. The converted program (shown in the listing) occupies 4067 bytes, which should allow sufficient room for table and string storage even on 8K machines. The program was written in DOS 3.2 OSI BASIC. The string bug problem on some BASIC-in-ROM machines would be the only

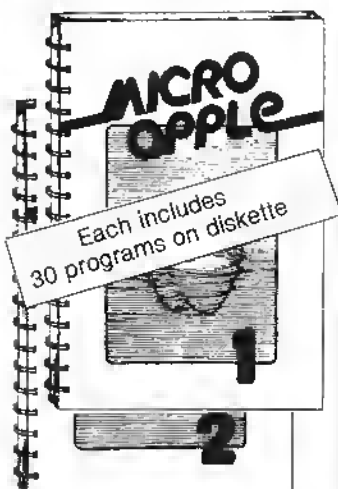
**Table 1: Changes to the PET Disassembler**

Line	Remarks
10	remove the PET string bug fix
15	remove the PET string bug fix
40	add line for title
45	print code for output devices
50	change prompts
51	move "if statement" from line 50 to 51
105	change "GET" to PEEK(57088) = 5 for left shift
115	change to prompt for instructions
116	check for escape key, PEEK(57088) = 33
119	add to check for right shift, PEEK(57088) = 3
125	change from RETURN to GOTO116
165	change "=" to "#\$"
295	change to E = PEEK(P)
550	} remove SPC(8 - LEN(E\$)); to cause variable and address list to be printed in 2 columns
565	
575	
all lines	change PRINT #1 to PRINT
471	additional lines had to be added
481	to data statements because of length
486	"
491	"
501	"
511	"
516	"
531	"
536	"

## Three IMPORTANT Books for your APPLE



The **MOST Complete** MEMORY MAP of the Apple ever published. \$14.95\* 128 pages



\$24.95\* each Two **SUPERB** blends of articles and programs from MICRO magazine for the Apple. 224 pages w/DISK

To order, call toll-free  
**1-800-227-1617 Ext. 564**

In California:  
1-800-772-3545 Ext. 564

Master  
Card &  
VISA  
Accepted

**MICRO INK, Inc.**  
34 Chelmsford St.  
P.O. Box 0502  
Chelmsford, MA 01824

\*Add \$2.00 for shipping.  
Massachusetts residents add 5% tax.

potential reason for it not working on all OSI 6502 systems.

I have changed the program to allow the "left shift" to stop the disassembly, "right shift" to resume, and "escape" to allow the user to list the addresses of the machine-generated labels. The program prompts the user for the output devices: two for the CRT and ten for the CRT and unit four (parallel) printer. Should you have a serial printer, three should be used in place of ten.

As in Kolhe's program, two passes through the program are necessary to get all the symbolic labels. I usually make the first pass using the CRT as the output device, and the second pass

with the printer activated. Then I print out the symbolic labels and their addresses. The program runs quite fast, disassembling eight pages of code (2K bytes) in about seven minutes. When the Centronics 737 printer is used, the system takes about 35 minutes for eight pages.

David Pitts is an Aerospace Technologist at the NASA-Johnson Space Center in Houston, Texas. His training is in Engineering Physics, Geophysics, and Meteorology, and he has been involved in the Gemini, Apollo, Skylab and Landsat spacecraft programs. He has programmed in FORTRAN on IBM, Univac, and DEC machines since the 1960's and only recently has been programming in BASIC.

```

2 REM SYMBOLIC DISASSEMBLER FOR PET BY WERNER KOLBE-MICRO, JAN81-PC 23
3 REM AS MODIFIED BY DAVID PITTS FOR OSI 4PMF
5 DM=255:PM=50
20 DIMM$(255),L$(OM),L(OM),Z$(255),Z%(255),P(PM),P$(PM)
25 DM=DM-1:PM=PM-1:Z$(0)="ZERO":L$(0)="LABEL":P$(0)="PAGE >0"
30 FORI=0TO255:READM$(I):NEXT
40 PRINTTAB(25);"DISASSEMBLER":PRINT:PRINT:PRINT
41 PRINT"<LSHIFT> TO STOP":PRINT
45 INPUT"OUTPUT DEVICE (2=CRT, 10=CRT & LINE PRINTER)";D:POKE8994,D
50 FL=1:INPUT"STARTING HEX LOC (OR LABEL CODE)";E$:PRINT
51 IFE$="PM"THENV$="":GOTO545
55 IFE$="PL"THENV$="L":GOTO545
60 IFE$="PJ"THENV$="J":GOTO545
65 IFE$="PZ"THEN560
70 IFE$="PW"THEN570
72 IFE$="ENTRY"THEN600
75 GOSUB280:P=E-1
80 P=P+1:E=P:S=1:GOSUB325:IFL$<>" "THENFL=1
85 GOSUB300
90 PRINTSPC(5-LEN(E$)):E$;:GOSUB295:PRINT" "E$;:K=5
92 M$=LEFT$(M$(E),3):B=VAL(MID$(M$(E),4))
95 ONB*FL+1GOSUB135,165,170,180,185,190,210,215,220,235,240,250,260,265
105 IFPEEK(570BB)=5THENGOTO115
110 GOTO80
115 PRINT:PRINT"<ESC> FOR LABEL ADDRESSES, <RSHIFT> TO CONT"
116 IFPEEK(570BB)=33THENPRINT"LABEL CODE=PM,PL,PJ,PZ,PW":GOTO50
119 IFPEEK(570BB)=3THEN105
125 GOTO116
130 PRINT" "E$SPC(K)L$SPC(7-LEN(L$))M$ " ";:RETURN
135 IFFL=1ANDM$<>"?"THENPRINTSPC(8)L$SPC(7-LEN(L$))M$:RETURN
140 FL=0:IFM$="BRK"THENFL=1:PRINT:RETURN
145 PRINTSPC(15)"? " "CHR$(34);:IFE>30AND<12BTHENPRINTCHR$(E)
150 IFE<30THENPRINTCHR$(E+64)
155 IFE>127THENPRINTCHR$(E-12B)
160 RETURN
165 GOSUB290:GOSUB130:PRINT"##"E$:RETURN
170 V$=""
175 GOSUB290:GOSUB130:GOSUB3B0:PRINTZ$V$:RETURN
180 V$=","X":GOTO175
185 V$=","Y":GOTO175
190 V$=""
195 GOSUB290:PRINT" "E$;:H$=E$:GOSUB290:K=2
200 GOSUB130:E$=E$+H$:GOSUB2B0:IFF$<>" "THENPRINTP$V$:RETURN
205 PRINTE$V$:RETURN
210 V$=","X":GOTO195
215 V$=","Y":GOTO195
220 GOSUB290:A1=E:GOSUB130:E=A1+P+1:IFA1>127THENE=P-255+A1
225 V$="L":S=0:GOSUB325:IFBTHENPRINTL$:RETURN
230 GOSUB300:PRINTE$:RETURN
235 V$=","X":GOTO245
240 V$=","Y"

```

```

245 GDSUB290:GDSUB130:GDSUB380:PRINT"("Z$V$:RETURN
250 GDSUB290:PRINT" "E$;H$=E$:COSUB290:K=2:GDSUB130
255 PRINT"("E$H$")":RETURN
260 PRINT9PC(8)LSPEC(7-LEN(L$))M$A":RETURN
265 COSUB290:PRINT" "E$;H$=E$:COSUB290:K=2:GDSUB130:E$=E$+H$:GDSUB280
270 V$="J":S=0:GDSUB325:IFL<<" "THENPRINTL$:RETURN
275 PRINTL$:RETURN
280 E=0:FORI=1TOLEN(E$):B=ASC(MID$(E$,I,1))-48:IFB>9THENB=B-7
285 E=E*16+B:NEXT:RETURN
290 P=P+1
295 E=PEEK(P)
300 B=E:E$=""
305 H=INT(B/16):B=INT(B-16*H):B$=CHR$(B+48):IFB>9THENB$=CHR$(55+B)
310 E$=B$+E$:IFH>=1THENB=H:GOTO305
315 IFLEN(E$)<2THENE$=""0"+E$
320 RETURN
325 B=-1:H=LL+1
330 I=INT((H+B)/2):IFL(I)=ETHENB=1:L$=L$(I):RETURN
335 IFL(I)>ETHENH=I:GOTO345
340 B=I
345 IFABS(N-B)>1THEN330
350 IFSOR(LL>DM)THENB=0:L$=""":RETURN
355 LL=LL+1:IFL(I)<ETHENI=I+1
360 FORB=LLTOI+1STEP-1:L(B)=L(B-1):L$(B)=L$(B-1):NEXT
365 L(I)=E:L$(I)=V$+MID$(STR$(LL),2)
370 B=0:L$=L$(I):IFE>PTHENB=1
375 RETURN
380 B=-1:H=ZZ+1
385 I=INT((H+B)/2):IFZX(I)=ETHENZ$=Z$(I):RETURN
390 IFZX(I)>ETHENH=I:GOTO400
395 B=I
400 IFABS(H-B)>1THEN385
405 ZZ=ZZ+1:IFZX(I)<ETHENI=I+1
410 FORB=ZZTOI+1STEP-1:ZX(B)=ZX(B-1):Z$(B)=Z$(B-1):NEXT:ZX(I)=E
412 IFS=2THENZ$(I)=V$:RETURN
415 Z$(I)="Z"+MID$(STR$(ZZ),2):Z$=Z$(I):RETURN
420 IFE<256THENGDSUB380:P$=Z$:RETURN
425 B=-1:H=PP+1
430 I=INT((H+B)/2):IFP(I)=ETHENP$=P$(I):RETURN
435 IFP(I)>ETHENH=I:GOTO445
440 B=I
445 IFABS(H-B)>1THEN430
450 IFPP>PMTHENP$=""":RETURN
455 PP=PP+1:IFP(I)<ETHENI=I+1
460 FORB=PPTOI+1STEP-1:P(B)=P(B-1):P$(B)=P$(B-1):NEXT:P(I)=E
462 IFS=2THENP$(I)=V$:RETURN
465 P$(I)="H"+MID$(STR$(PP),2):P$=P$(I):RETURN
470 DATABRK,DRA9,?,?,DRA2,ASL2,?,PHF,DRA1,ASL12,?,?,DRA5,ASL5,?,BPLB
471 DATADRA18
475 DATA?,?,DRA3,ASL3,?,CLC,DRA7,?,?,DRA6,ASL6,?,JSR13,AND9,?
480 DATA?,BIT2,AND2,RDL2,?,PLP,AND1,RDL12,?,BIT5,AND5,RDL5,?,BMI8,AND10
481 DATA?,?,?
485 DATAAND3,RDL3,?,SEC,AND7,?,?,AND6,RDL6,?,RTI,EOR9,?,?,EOR2
486 DATALSR2
490 DATA?,PNA,EOR1,LSR12,?,JMP13,EOR5,LSR5,?,BVCB,EOR10,?,?,EOR3,LSR3
491 DATA?
495 DATACLI,EOR7,?,?,EOR6,LSR6,?,RTS,ADC9,?,?,ADC2,RDR2,?,PLA,ADC1
500 DATARDR12,?,JMP11,ADC5,RDR5,?,BVS8,ADC10,?,?,ADC3,RDR3,?,SEI
501 DATAADC7,?,?
505 DATA?,ADC6,RDR6,?,?,STA9,?,?,STY2,STA2,STX2,?,DEY,?,TXA,?,STY5,STA5
510 DATASTX5,?,BCCB,STA10,?,?,STY3,STA3,STX3,?,TYA,STA7,TXS,?,?,STA6,?
511 DATA?
515 DATALDY1,LDA9,LDX1,?,LDY2,LDA2,LDX2,?,TAY,LDA1,TAX,?,LDY5,LDA5
516 DATALDX5,?
520 DATA8CS8,LDA10,?,?,LDY3,LDA3,LDX4,?,CLV,LOA7,TSX,?,LDY6,LDA6,LDX7,
525 DATACPY1,CMP9,?,?,CPY2,CMP2,DEC2,?,INY,CMP1,DEX,?,CPY5,CMP5,DEC5,?
530 DATA8NE8,CMP10,?,?,CMP3,DEC3,?,CLD,CMP7,?,?,CMP6,DEC6,?,CPX1
531 DATASBC9
535 DATA?,?,CPX2,SBC2,INC2,?,INX,SBC1,NDP,?,CPX5,SBC5,INC5,?,BEQ8,SBC10
536 DATA?,?
540 DATA?,SBC3,INC3,?,SED,SBC7,?,?,SBC6,INC6,?
545 FORI=0TOLL:IFV$<>" "THENIFLEFT$(L$(I),1)<>V$THEN555
550 E=L(I):GDSUB300:PRINTL$(I)SPC(8-LEN(L$(I))):E$
555 NEXT:PRINT:GOTO45
560 FORI=0TOZZ:E=ZX(I):GDSUB300
565 PRINTZ$(I)SPC(8-LEN(Z$(I))):E$:GOTO555
570 FORI=0TOPP:E=P(I):GDSUB300
575 PRINTP$(I)SPC(8-LEN(P$(I))):E$:GOTO555
600 S=2:INPUT"NAME, AD";V$,E$:IFV$<>"END"THENGDSUB280:GDSUB420:GOTO600
605 GOTO45
1000 FORI=14TO33:PRINTCHR$(34)CHR$(I)CHR$(34):NEXT
1001 END

```

MICRO

# OHIO SCIENTIFIC

NEW & USED SYSTEMS

- HARDWARE
- SOFTWARE
- PARTS
- ACCESSORIES

-SERVICE AVAILABLE-

**SUNSET ELECTRONICS**  
2254 TARAVAL ST.  
SAN FRANCISCO, CA 94116  
(415) 665-8330

## OHIO SCIENTIFIC

**THE WIZARD'S CITY** — search for gold in the dungeons beneath the Wizard's city or in the surrounding forest. A dynamic adventure allowing progress in strength and experience. All OSI — cassette \$12.95, disk \$15.95.

**OSI HARDWARE 15% OFF RETAIL PRICES!**

**GALACTIC EMPIRE** — a strategy game of interstellar conquest and negotiation. Compete to discover, conquer, and rule an empire with the computer or 1-2 other players. C4P, C8P cassette \$12.95, disk \$15.95.

**AIR TRAFFIC ADVENTURE** — a real time air traffic simulation. C4P, C8P disks \$15.95.

Plus S-FORTH, FAILSAFE +2, RPV CONTROL, ADVENTURE, TOUCH TYPING, INTELLIGENT TERMINAL and more. Send for our free catalog including photos and complete descriptions.

**Aurora Software Associates**  
37 S. Mitchell  
Arlington Heights  
Illinois 60005

# The A2-GE1 Graphics Editor for the Apple II

The A2-GE1 Graphics Editor is a collection of programs designed to put the power of A2-3D1 and A2-3D2 graphics in your hands.

The A2-GE1 includes **Object Editor**, **Motion Programmer**, **Motion Playback**, **Slideshow Playback**, and a special A2-3D2 interface for BASIC programmers.

With **Object Editor** you can create whatever objects you want in the colors of your choice. You can also type in whatever 3D text you want, and in different sizes. And saving an object is as easy as naming it.

Then give the object names to **Motion Programmer** and see how the beautifully laid out keyboard controls will let you switch objects on or off, animate them, or add upper or lower case 2D text mixed right in.

You can also record your entire presentation, animation and all, for later use with **Motion Playback**, or just take "computer snapshots" of scenes with **Slide Show Playback**.

We've reached our goal of giving you the most sophisticated graphics utilities in the marketplace...

## Convenient graphics power...



*See them now at your dealer!*

## subLOGIC

Communications Corp.  
713 Edgebrook Drive  
Champaign, IL 61820  
(217) 359-8482  
Telex: 206995

### A2-GE1 Graphics Editor

\$34.95 on disk (48K and  
A2-3D2 required)

### A2-3D1 with 3D2 Enhancement\*

\$84.90 on disk (48K required)

\*3D1 owners may update to 3D2 for \$24.95. Contact SubLOGIC for details.

Apple is the registered trademark of Apple Computer Inc.

For direct order, include \$3 for UPS or \$5 for first class mail delivery.  
Illinois residents add 5% sales tax. Visa and MasterCard accepted



# Pascal Tutorial

## Part 2

Victor R. Fricke  
325 Ramapo Valley Road  
Mahwah, New Jersey 07430

### Filer Revisited

The Apple Pascal Filer is a system program whose primary function is to manage and control the interaction of the system with disk files. One particular file is handled in a special way by the system. This special file is the "workfile." When you Q(uit a session with the Editor, the Filer makes a copy of the text you were working on. This copy is placed on the disk as a TEXT file, with the file name of SYSTEM.WRK.TEXT.

The Editor scans the disk directory of the disk from which you booted the system. If it sees a program called SYSTEM.WRK.TEXT, it automatically reads it from the disk and displays it on the screen. The Editor assumes that you want to work on the workfile. But what if you want to stop working on one file and start working on another? The Filer is provided with two commands for this very purpose. C(hange can be used to change the name of SYSTEM.WRK.TEXT, and G(et can be used to designate a different file as the workfile.

### C(hange

Suppose you have been working on a business accounting package. You have just successfully compiled a General Ledger program, and now want to turn your attention to writing the Accounts Payable program. You need to save the GL program under a different name, like LEDGER.TEXT. There are already copies on the disk of both the text and code files for this program, but they are named SYSTEM.WRK.TEXT and SYSTEM.WRK.CODE.

You could, of course, go back to the Editor and then Q(uit by using the W(rite option, but this is not very efficient. First, the Editor would read SYSTEM.WRK.TEXT back into memory when you invoke it, even though it is already there. Second, SYSTEM.WRK.CODE would not be renamed by this process.

A better method would be to go into the filer, and select the C(hange option. The prompt line will say:

CHANGE? Respond by typing  
SYSTEM.WRK.TEXT

The system answers with:

CHANGE TO WHAT? You can now answer LEDGER.TEXT. The system response will be SYSTEM.WRK.TEXT  
->LEDGER.TEXT.

After you do this, there is no longer a file named SYSTEM.WRK.TEXT in the disk directory. The file is still there, but its name has been changed. Now when you enter the Editor, there is no workfile to be automatically read from the disk. You can start a new one, and when you Q(uit, it will be saved as SYSTEM.WRK.TEXT.

The previous sequence of commands shows how to change a file name. This can be made even simpler. The two responses given above can be made at the same time, if they are separated by a comma. Thus, in response to CHANGE? you can type SYSTEM.WRK.TEXT,LEDGER.TEXT and get the same result.

If you want to change several files with similar names, you can use the "wild card" characters, '=' and '?'. Suppose your diskette contained the following files:

SUPER.LEDGER.TEXT  
SUPER.PAYABLE.TEXT  
SUPER.RCVABLE.TEXT  
SUPER.STARTREK

If you wanted to rename all these files without the SUPER prefix, you could C(hange each name, one at a time. However, there is an easier way; use the "wild card."

From the Filer press C(hange. When asked CHANGE? type SUPER.=, = and the response will be

SUPER.LEDGER.TEXT ->  
LEDGER.TEXT  
SUPER.PAYABLE.TEXT ->  
PAYABLE.TEXT  
SUPER.RCVABLE.TEXT ->  
RCVABLE.TEXT  
SUPER.STARTREK ->  
STARTREK

The system selects those files that have the prefix SUPER. and any suffix (represented by the wild card character) and changes its name to just the suffix.

If you wanted to change the name of all the accounting files, but leave SUPER.STARTREK alone, you could have followed one of two options. You could have answered the prompt with

SUPER.=.TEXT,=.TEXT

or,

SUPER.?,?

When '?' is used instead of '=', the system stops before each file name change and requests verification that the change of name is desired for that file. It will prompt with

CHANGE SUPER.LEDGER.TEXT ?

If you respond by pressing 'Y', the response will be

## SUPER.LEDGER.TEXT → LEDGER.TEXT

If you press any other key, the change will not be made, and the system will continue looking for more file names to change according to your instructions. In this way you can examine each name change before it is made and select those which you really want to change.

When there is no workfile defined, or you have just renamed SYSTEM.WRK.TEXT, the system is not able to automatically load the workfile. If you want to designate a different file as the workfile, select the Filer command G{et. The response will be

GET ?

You then respond with the name of the file you want to be the workfile. But there is one trick on a one-disk drive system like mine. The file you select by the G{et command has to be physically on the system diskette (the one with the system programs on it). If it is on another diskette, transfer it to the system diskette before using the G{et command.

The N{ew command is used to delete the current workfile. If there is a SYSTEM.WRK.TEXT or SYSTEM.WRK.CODE file on the disk, the response to the N{ew command is

THROW AWAY CURRENT  
WORKFILE?

If you answer 'Y', the workfiles are removed from memory and the disk directory. If you press any other key, the N{ew command is cancelled. If there is no SYSTEM.WRK.TEXT or CODE file and you have designated a workfile by the G{et command, the N{ew command de-designates it, but does not remove it from the disk.

To find out what the system configuration is, The V{olumes command is used. This command is inherited from the UCSD System, which on occasion is run on large computers, small computers, time-sharing computers, or other hardware. The system software is set up to deal with all the possible hardware variations by regarding each device it can communicate with as a volume.

When you select the V{olumes command, the display, for a single drive system, will look like this:

```
VOLS ON-LINE:
1  CONSOLE:
2  SYSTERM:
4 #  APPLE0:
ROOT VOL IS - APPLE0:
PREFIX IS      - APPLE0:
```

The volume number designations, since they were set up for the UCSD system, do not correspond to peripheral slot numbers. For example, Volume 4 represents the on-line disk in drive I, in slot 6.

The volume designated as CONSOLE: (Volume 1) is the video display; Volume 2, SYSTERM:, is the keyboard. A '#' symbol in front of the volume name indicates that it is a "block-structured" volume, or diskette.

The "ROOT VOL" referred to is the volume from which the system software was booted up. The "PREFIX" is the name of the default volume; that is, the volume that is assumed when only the file name is given to the system. This is ordinarily the same as the root volume, but can be changed by using the P{refix command.

For further information about system volume numbers and what peripheral slots they can represent, refer to Appendix D in the back of the *Operating System Manual*.

## Directory Commands

There are several commands which access the directory or modify its contents.

Z{ero Wipes out the directory. Programs are still on the disk, but the system can't find them because the directory is empty. The only time this might be of any use is if you want to re-use an old disk.

R{emove Used to delete a file from the directory. The file is still on the disk, but after a R{emove, the system thinks that the area where the file is recorded is available for use. Subsequent file creation can wipe out the file just R{emoved.

K{runch This command is used to move the existing files together on the disk, making all the remaining unused space on the disk contiguous. Since this method involves reading files and writing them elsewhere on

the disk, this command should be used sparingly. A disk error or power failure during a K{runch operation could cause permanent loss of some files.

M{ake This command is used to create a dummy file and put its name into the directory. The only reason I can see for doing this is to try to recover an inadvertently R{emoved file. For example, I R{emove a file called JUNK.TEXT. I realize that I have just killed my only copy of a useful file by that name. When I use the E{x(ended directory list command, I see an area of nine blocks between two files marked <UNUSED> I think that might be where JUNK.TEXT is recorded.

I use the M{ake command and give it JUNK.TEXT[9] as the name of the new file. The 9 in the square brackets is the number of blocks to allocate for the file. This procedure will recover the lost file.

If you use the M{ake command and use a file name without the size specified in square brackets, the new dummy file will still be made, and it will fill the largest unused area. If you use an asterisk in the square brackets, the new file will occupy either one half of the largest unused area, or the next-to-largest unused area, whichever is larger.

## Bad Disk Blocks

The system provides a command, B{ad blocks, which instructs it to scan the disk for flaws and identify them. This involves a "CRC," or "cyclic redundancy checksum." When a block of data is recorded on the disk, the CRC is calculated and stored in the sector along with the data.

When the B{ad blocks command is selected, the system reads each sector, calculates the checksum for the data in that sector, and then compares the result with the CRC stored on the disk. If after ten attempts, no match occurs between the calculated and recorded checksums, the system concludes that a bad block has been found.

Make note of the bad blocks found by the scan. Although they cannot be fixed, the system can mark them as bad. You invoke this operation by using the Xamine command. This causes the system to mark the bad blocks as a file with the suffix .BAD. This is important because in a Krunch, the system will not attempt to move any portion of a file into the bad block.

Unfortunately, the file which contained the bad block will not be recovered, but at least you will not jeopardize any other good files. It is a good idea to use the BAd blocks and Xamine commands right away when you first initialize a diskette for Pascal files.

## Compiler

The Pascal Compiler is a translation program. It translates a Pascal text into a different language, "p-code." The Apple is a willing servant, and will carry out any instruction it receives, as long as it can understand the instruction. Of course, the only instructions it understands are those written in 6502 machine language.

Normally, humans do not communicate in machine language; it is hard to deal with binary bytes. The

closest one usually comes is assembly language. But fortunately, the Apple monitor understands assembly language, and is prepared to interpret it to the 6502 CPU. The mini-assembler system program does this.

Carrying the analogy a step further, assembly is not a comfortable language for the average programmer. Most would rather speak BASIC, since it resembles English. Fortunately, the Apple also has a BASIC interpreter.

An interpreted program is inherently slower-running than it could be, since each statement is decoded as it is encountered. If a loop is executed a thousand times, the loop statements are decoded a thousand times. It would be much more efficient to do the decoding only once, translate into machine code, and then run the translated program.

A compiler takes a high-level language program, understandable by a human, and translates it into a low-level language that the CPU understands. The advantage is that the low-level language is more concise, and therefore uses less valuable memory space, and runs faster. The disadvantage is that if you make one small change, the program must be recompiled. This is usually not much of a problem, except during program development.

Now Pascal, a new language designed from scratch to have a lot of desirable features, eliminates a lot of the weaknesses and faults of existing languages. The designers wanted it to be a compiled language, but they faced a problem: different computers spoke different machine languages.

The Apple speaks 6502, the TRS-80 Color Computer speaks 6809, and other machine languages for other processors abound. A compiler is a very complex program, and writing a Pascal compiler for each of the possible processors multiplied the problem.

The solution was to invent a new low-level language, "p-code," and to write only one compiler, Pascal to "p-code," the universal low-level language. Now, to use the Pascal system software on a new microprocessor, only a "p-code" interpreter need be written. Interpreters are much easier to write than compilers.

A Pascal program is a text file on the disk. All the compiler does is read the text file, translate it into "p-code," and write a code file onto the disk. Very little interaction with the user is needed for this type of operation. However, there are a few options available. Rather than using a prompt line approach, the compiler options are se-

## LETTER QUALITY WORD PROCESSOR PRINTER/TYPEWRITER

FOR APPLE, ATARI, COMMODORE, NEC, OSBORNE 1, TRS 80 and others

### OLYMPIA ES100/101

- 92 character electronic keyboard
- 8 character buffer memory
- Dual pitch, 10 and 12
- 17.5 C.P.S.
- All settings from keyboard
- Auto. correction
- Daisy type print mechanism
- Cartridge ribbons
- 14 1/8 inches writing line
- 1400 dealers nationwide

### REN TEC ES

- Installation in 15 minutes using existing ES100/101 cables
- CMOS logic for minimal drain on ES100 power supply
- Hi or low true status bits
- Accepts RS232 serial with 7 crystal controlled Baud rates
- Accepts Centronics parallel interface
- Selectable auto. line feed



**\$1495.00\* ES100 TYPEWRITER & INTERFACE**

**\$295.00 INTERFACE**

Sug. Retail

\* \* \* \* \*

**NEC Dot Matrix Printer**  
100 CPS  
Bidirectional printing  
Friction and tractor feed  
Parallel Interface  
Single ribbon cartridge

795.00

**NEC Monitors**  
12" Green Screen  
12" RGB Color  
12" Composite Video

285.00  
1095.00  
430.00

**ATARI 10-Key Accounting Pad**

124.95

DEALER INQUIRIES WELCOME



**RENAISSANCE  
TECHNOLOGY  
CORPORATION**

3347 VINCENT ROAD  
PLEASANT HILL, CALIFORNIA 94523  
(415) 930-7707



# Communications Software from the Utility Specialists

What do you really need in good communications software? We think the most important thing is using the equipment YOU have to transfer data easily and accurately. When Ascii Express made its first appearance in 1979, it was immediately recognized as the finest program of its kind available. Since that time, other programs have appeared with one or two flashy new features, but not a single one of them offers as many choices in terms of hardware compatibility and data transfer modes as the SDS line of communications software.

**ASCII EXPRESS II™**  
If a versatile and accurate data transfer program is what you're after, Ascii Express II is for you. It offers more data transfer modes than any other program of its kind. In fact, we have yet to find a computer system it can't be used with.

In addition, Ascii Express II offers a built-in editor that allows you to produce or modify files before and after transfer, a built-in directory for your most frequently called numbers, and keyboard macros which allow you to send entire sign-on sequences or other host commands with a few simple keystrokes. All these features are designed to help reduce on-line time, and that saves you money.

## Z-TERM™

For CP/M users, Z-Term offers all the above, and more...

- Support of all 80-column boards and external terminals
- Large copy buffer (41K)
- Unlimited download capacity - no file is too large

For special applications, Z-Term will even allow your Apple to emulate most popular types of terminals for maximum compatibility with your system.

## Z-TERM "THE PROFESSIONAL"™

The ultimate communications package. This is the finest program we offer, and it is certain to set the standard for all communications software for years to come.

Z-Term "Pro" provides the solid performance that the truly serious user demands. Many of our users find Z-Term "Pro" to be so valuable that it more than justifies the purchase of the Z-80 Softcard.

Z-Term Pro's special features include:

- Support of the new Novation Apple CAT modem
- Support of specialized transfer protocols, e.g. PAN and Christensen
- Automatic answer and send/receive modes for untended operation
- Special buffer for parallel printers to ensure no lost characters

We are so convinced that all the SDS programs are the finest available that we've compiled a detailed point-by-point comparison of our programs and those of our leading competitors (for your copy, send a stamped, self-addressed envelope to us at the address below). This comparison of more than 50 items clearly shows what our customers have known all along - that SDS software is the finest. Amen.

# SDS

## southwestern data systems

P.O. Box 582-M  
Santee, CA 92071 Tel. 714-562-3670

# TRYING TO MAKE CONTACT?





# ★ SOFTWARE FOR OSI

**VIDEO GAMES 3** ..... **NEW!** ..... **\$14.95**  
 Three games. Meteor Mission is an asteroids game. Space Wars is a battle between two starships. Meteor Wars is a combination of the two above games. All three are in machine language with fast, real time action, and super graphics.

**ADVENTURE: IMMORTALITY** ..... **NEW!** ..... **\$11.95**  
 You are an intrepid explorer searching for the fabled "Dust of Immortality". This is the largest adventure yet available for 8K OSI! With hidden room loads so you can't cheat.

**SUPER BUG!** ..... **\$6.95**  
 Here's a super-fast, BASIC/Machine language hybrid race game. Ten levels of difficulty and a minutely changing track will keep you challenged.

**STARGATE MERCHANT** ..... **\$9.95**  
 You are a trader in the distant future, traveling through "stargates" to get to various star systems. Part video game, part board game, always challenging.

**ADVENTURE: MAROONED IN SPACE** ..... **\$11.95**  
 An adventure that runs in 8K! Save your ship and yourself from destruction.

**DUNGEON CHASE** ..... **\$9.95**  
 A real-time video game where you explore a twenty level dungeon.

**DISASSEMBLER** ..... **\$11.95**  
 Use this to look at the ROMs in your machine to see what makes BASIC tick. Reconstruct the assembler source code of machine language programs to understand how they work. Our disassembler outputs unique suffixes which identify the addressing mode being used, no other program has this!

**SUPER! BIORHYTHMS** ..... **\$14.95**  
 A sophisticated biorhythm program with many unique features.

For all BASIC-m-ROM systems. Selected programs available on disk. Color and sound on video games.

Write for **FREE** catalog  
 (For International requests, please supply 2 oz. postage)



## ORION SOFTWARE ASSO.

147 Main St, Ossining, NY 10562

## THE ultimate in SPEED and language PDWER for the APPLE II : THE INTEGER BASIC COMPILER

- SPEED IMPROVEMENT BY A FACTOR OF 10 TO 20 OVER APPLE'S BASIC INTERPRETER - 15 TO 30 OVER APPLESOFT!
- NO LANGUAGE CARD NECESSARY!
- OPTIMIZE CODE FOR YOUR SPEED/SPACE REQUIREMENTS.
- OBJECT CODE AND RUN-TIME SYSTEM ARE COMPLETELY RELOCATABLE - USE MEMORY THE WAY YOU WANT TO!
- MANY POWERFUL BASIC LANGUAGE EXTENSIONS:
  - FULL STRING LENGTH OF 32767 - NO 255 LIMIT!
  - CHR\$, GET AND KEY FUNCTIONS.
  - DIRECT HI-RES GRAPHICS SUPPORT.
  - HOME, INVERT, NORMAL, FLASH, AND MORE!
- MANY APPLICATIONS - EXISTING INTEGER PROGRAMS CAN BE EASILY CONVERTED TO RUN ON ANY APPLE II!
- COMPILER REQUIRES: APPLE II (OR II PLUS WITH INTEGER OR LANGUAGE CARD), 48 K AND DOS 3.3.
- SUPPLIED ON 2 DISKS WITH COMPLETE DOCUMENTATION.

PRICE: \$ 149.50

Dealer Inquiries Invited.

(Calif. add 6.5% sales tax, Foreign add \$5.00 air mail)

GALFO SYSTEMS 6252 CAMINO VERDE  
 SAN JOSE, CA 95119

Apple, Applesoft - Trademarks of Apple Computer Co.

## utility city

21 of our most-asked-for Apple Utilities

by Bert Kersey

48K Applesoft ROM

For YOUR Big Apple—Our #1 most-asked-for Apple Utilities on one big disk—List Formatter makes properly spaced & indented listings with printer page breaks. Each program statement is on a new line with If-Then's & Loops called out; a great de-bugger! Catalog in my number of columns & any page-width to CRT or printer. Automatically post the Run Number & last-used Date in your programs. Make any command invisible in your listings. Access program lines in memory for garbage repair & "Illegal" Alteration; Quickly sort & store info on disk. Run any Applesoft file while another stays in RAM; Move lines within your programs; Renumber to 65535, Save Inverse, INVISIBLE & back file names; Convert dec to hex & binary, or INT to FP; Append programs; Dump the text screen to ANY printer... More too. \$1 Programs. Total!

### PLUS... APPLE TIP BOOK NUMBER THREE!

40 PAGES of new tips, tricks & articles— "DOS Trickery," "Copy Stoppers," "Programming the Responder Key" & much more. Plus understandable explanations of how each utility & program works— One of the best Apple learning tools on the market today!

**\$29.95**  
 \$11.50 shipping

✓ Utility City on Applesoft Disk

✓ 40-page Beagle Bros Apple Tip Book #3

✓ Apple PEEKS, POKES & POINTERS Chart

## alpha plot

Hi-Res Apple Graphics/Text Utility

by Bert Kersey & Jack Cassidy

48K REQUIRED

**HI-RES DRAWING:** Create hi-res pictures & charts, appendable to your programs. Keyboard or Paddle control, Cursor X/Y-axis Cursor (see lines before you draw), Any color mix of REVERSE (opposite of background), Circles, Boxes & Ellipses, filled or not. Bonus Programs too—**SCRUNCHER** stores hi-res in as little as 1/3 normal disk space. **SHIFTER** transfers any portion of the hi-res screen. Also superimpose hi-res images and convert Hi-Res to Lo-Res & back for fascinating abstracts!

**HI-RES TEXT:** Beautiful upper & lower case with Descenders, color or Reverse, Positionable anywhere (NOT restricted by Tabs & Vtabs), Professional looking **PROPORTIONAL SPACING** Adjustable type size, leading (line spacing) & Kerning (letter spacing). Multi-directional typing: up, down, even backwards!

### PLUS... APPLE TIP BOOK NUMBER FOUR!

40 PAGES of tips for making the most of your Apple's advanced graphics capabilities. Alpha instructions plus shape table tips, new listing & color tricks and fascinating animation experiments!

**\$39.95**  
 \$11.50 shipping

✓ Alpha Plot on Applesoft Disk

✓ 40-page Beagle Bros Apple Tip Book #4

✓ Apple PEEKS, POKES & POINTERS Chart



**Beagle Bros**  
 MICRO SOFTWARE

4315 Sierra Vista  
 San Diego, CA 92103  
 714-296-6400

WITH EACH ORDER, YOU WILL RECEIVE...

- ☐ Dos Boss, Utility City or Alpha Plot on Applesoft Disk
- ☐ A 40-page Apple Tip Book (each entirely different)
- ☐ An 11x17 Apple PEEKS, POKES & POINTERS Chart

## dos boss

### DISK COMMAND EDITOR

by Bert Kersey & Jack Cassidy

A classic utility you will ENJOY! Known Commands: "Catalog" can be "Cat," etc. Save-Protect your programs; Unauthorized copy attempts produce "Not Copyable" message. 1-Key Program Selection from catalog (extremely handy); Catalog Customizer—Change Disk Volume message to your true, 0m or other file codes; Catalog by file type, etc. Rewrite Error Messages—"Syntax Error" can be "Oops!" or anything you want!

All of Dos Boss's change features may be appended to your programs, so that anytime using your disks on any Apple (booted or not) will be formatting DOS the way you designed it!

### PLUS... APPLE TIP BOOK NUMBER TWO!

With valuable DOS information "Poking Around in DOS," "Making Programs Uninstallable," "Two-Sided Disk Taps," "Care of Your Drive," "Creative Poking & Poking"—32 pp. 3.3," etc.

**ONLY \$24.**  
 \$11.50 shipping

✓ Dos Boss on Applesoft Disk

✓ 40-page Beagle Bros Apple Tip Book #2

✓ Apple PEEKS, POKES & POINTERS Chart

MINIMUM 32K REQUIRED

AT YOUR DEALER NOW OR ORDER BY PHONE AT ANY HOUR... TOLL FREE!

Ask around about Beagle Bros Software.

Our programs are practical, friendly & user-oriented, and always come with an amazing amount of documentation & juicy Apple Information. If your dealer doesn't have our stuff, get on his case about it, or order directly from us. We ship all disks & books WITHIN 48 HOURS.

## NEW Apple Utility Disks!

### With Free PEEKS & POKES Wall Chart!



(not available separately)

### BONUS WITH EACH DISK!

POKE your Apple all night long with this handy 11x17 reference poster! The most useable PEEKS, POKES, POINTERS & CALLS scrounged up from every source imaginable! A great companion to our original Apple Command Chart.

## 24 hour TOLL FREE Order Desk:

MasterCard, VISA or COD orders, call:

Nationwide: 800-854-2003 ext. 827

California: 800-522-1500 ext. 827

Alaska/Hawaii: 800-854-2622 ext. 827

(Orders only please. Questions, phone 714-296-6400. T. COD orders, add \$3.)

Or order by mail (use this coupon or separate sheet)

**RUSH!** The disks checked below

Plus The Tip Book and PEEKS & POKES Chart!

☐ UTILITY CITY ☐ ALPHA PLOT ☐ DOS BOSS

(\$31) (\$41) (\$25.50)

(Price includes First Class Shipping; Calif. residents add 6%)

Specify: ☐ 3.2 ☐ 3.3

NAMES=

ADDRES=

CITY=

ZIP=

VISA

MasterCard

VISA/MasterCard: Include Account No. & Expiration Date.

Mail U.S. check, money order or Visa/MC Numbers

to BEAGLE BROS., Dept. T

4315 Sierra Vista,

San Diego, CA 92103

Telephone (714) 296-6400.

Please add \$4.50 for shipping outside US or Canada.

COD orders, add \$3. California residents, add 6%.

# BUG BYTER

**Bill Budge, creator of  
"Raster Blaster," needs it:**

"...I'll never write another  
program without BugByter!"

## **FEATURES INCLUDE:**

- All registers displayed
- Compatible with all Apple languages
- Completely relocatable
- Full hex and ASCII I/O
- Multiple options while in trace mode
- Literal and transparent breakpoints
- Resident assembler
- Resident disassembler
- User-definable screen
- Ram screen dump in hex and ASCII
- Comprehensive documentation
- Single keystroke operation
- Instruction cycle counter
- Hexadecimal/decimal conversions
- Can run in add-on ram card

## **Who else needs BugByter?**

- ... Apple\* users who want to learn machine language.
- ... Apple programmers in need of a complete 6502 debugging tool.
- ... Educators who need to demonstrate the operation of the Apple's central processor.
- ... Software professionals who need to display and control all 6502 registers.

## **BugByter**

is

**NOW AVAILABLE AT \$39.95**

on diskette for Apple II or Apple II+

from

**COMPUTER-ADVANCED IDEAS, INC.**

1442A Walnut Street, Suite 341

Berkeley, CA 94709

(415) 526-9100

\*Apple is a registered trademark of Apple Computer, Inc.

# Flags and Boolean Algebra in Microsoft BASICs

**Microsoft BASICs, unlike other BASICs, can handle the assignment of Boolean variables. Furthermore, OSI and PET versions work on the bit level. Both features allow implementation of some very powerful program structures.**

Mark Guzdial  
1451 Seminole  
Royal Oak, Michigan 48071

Flags are variables that have only two values: a 'true' and a 'false'. They're heavily used in languages other than BASIC, such as PL/1 and FORTRAN, but this doesn't mean that they can't be used in BASIC and with practical benefit.

For example, a flag named ER could be set true upon an error condition. A statement using it might be 'IF ER THEN PRINT ER\$' thus printing an error message upon an error condition. Or, a flag called LP could indicate the presence of a line printer, so a print message might be 'PRINT A\$;IF LP THEN LPRINT A\$'.

Flags can be put to their greatest use by combining them with Boolean algebra (as discussed by Marvin Defong in MICRO 22:29). In some other languages, flag variables are referred to as Boolean. For example, we can combine our last two examples by printing an error message to the printer with 'IF LP AND ER THEN LPRINT ER\$'.

In BASIC, if the flag is non-zero (a positive or negative number), it will be considered true and the statement after

the THEN will be executed. If the flag is zero, it will be considered false and the statement after the THEN will be skipped.

What really makes flags usable in Microsoft BASIC is that BASIC can actually handle the assignment of true and false values. For example, the statement  $A = B < 2$  is actually a valid statement in any Microsoft BASIC (including PET BASIC, OSI, Applesoft, and even Apple Integer BASIC, though it wasn't written by Microsoft!).

The explanation lies in the structure of BASIC. Discounting strings, there are two main types of expressions: arithmetic (those using addition, subtraction, functions and generally working with numbers) and logical (those that make comparisons such as  $=$ ,  $<$  or  $>$ ). In PET, OSI and Apple BASICs, the evaluation of these expressions is done by the same routine. That means that the expression between the IF and the THEN is evaluated the same way as the expression to the right of the '=' sign in the assignment statement. Therefore  $A = B + 2$  is just as valid as  $A = B < 2$ .

We can now also see what happens if we try the statement  $A = B = 0$ . The variable A will be set to true or false depending on whether or not B is equal to 0.

Let's digress slightly from our discussion of flag variable usage to discuss this evaluation routine. We know that BASIC can only put a number into the variable A, so what number does BASIC put into A when we use it to signify a true or false condition such as  $A = B < 2$ ?

If B is not less than 2, A will be set to 0 in all of these BASICs. From what we know about false conditions, this sounds correct. But it's true values that get tricky. If we consider Boolean algebra, true should be the complement

of false, or  $TRUE = NOT\ FALSE$ . So, logically, if B is less than 2 (using our example), A should get the value of 1 — the complement of 0.

In the Apple, both Integer and Applesoft BASICs return 1 for true values. But on OSI and PET BASICs, A will be set to -1! And believe it or not, this is a distinct advantage, though not a logical one.

In PET and OSI, flags and Boolean algebra are considered at a 'bit level' not as their logical values. This means that PET and OSI consider all numbers in terms of their binary digits. So the complement of 0 is:

$$NOT\ 0000\ 0000 = 1111\ 1111$$

For those of you familiar with two's complement notation (a method of representing negative numbers in machine code), you will recognize that the NOT of 0 is -1. A NOT of -1 would give you back the 0 which is correct. Also, since -1 is non-zero, it will be recognized as true so it will function correctly.

Note that while the Apple format can handle a -1 as being true (since it is non-zero), the OSI and PET formats cannot handle a 1 as being true if you're using Boolean algebra. A NOT of 1 would give you (in PET or OSI):

$$NOT\ 0000\ 0001 = 1111\ 1110$$

which is a two's complement -2, which (since it's non-zero) is still true.

This can be a distinct advantage. Though logically it's considerably easier to work with the Apple method of handling true and false, the bit-oriented way of the PET and OSI gives you another dimension of programming. For example, what is printed with the statement:

'PRINT 2 OR 4?'

In the Apple, you are logically ORing two non-zero (or true) values which leaves a true result, so a 1 is printed. However, on the PET or OSI a 6 is printed because

```

0000 0010
OR  0000 0100
0000 0110 = Decimal 6

```

This leaves us with the capacity of doing some very interesting computations with the PET or OSI computers.

Let's say, for example, that the variable A must be assigned a value based on variable B, but the relationship is totally illogical such as:

```

IF B = 1 THEN A = 5
IF B = 2 THEN A = 3
IF B = 3 THEN A = 7

```

One's first thought would probably be to either use multiple IF..THENs or an ON..GOTO. But by using flags, this assignment can be done on a single statement:

```

A = -((B=1)*5) OR ((B=2)*3)
OR ((B=3)*7)

```

We know that each of the conditional statements ( $B=n$ ) will be evaluated to either -1 or 0, depending on whether it's true or false. Only one of the three clauses can be true, so only one can evaluate to a number while the other two evaluate to zeros. A number logically ORed with two zeros leaves the number. The negative sign at the beginning is necessary since  $B=n$  will be evaluated to a negative 1 if true.

This type of statement cannot be used on the Apple because the statement will logically evaluate the ORs to either a 1 or 0, not the number that will be found.

Using Boolean algebra with flag variables opens up a whole new world of programming in BASIC. Complex IF..THENs can be broken down, IF..THEN..ELSE structures can be implemented and sometimes, IF..THENs can be avoided completely. I hope that you find the use of flag variables in 6502 BASICs to be beneficial to your programming in BASIC.

MICRO

## DRAGON BYTE SOFTWARE PRESENTS

UNIQUE PROGRAMS  
FOR OHIO SCIENTIFIC  
POLLED KEYBOARDS \*

2001/2002PC — States & Capitals  
Capitals & States One Cassette

2003PC — Capitals of the World

2004PC — Protectorate Capitals

2005PC — Presidential Campaigns,  
1788 to 1980

All programs except Presidential  
Campaigns available for serial terminal.  
Specify number without PC suffix.

CASSETTE...\$9.95 Diskette...\$12.95  
All five on one disk...\$29.95  
C-10 Blank Cassettes...10/\$4.99

SPECIAL! OSI Disk Expansion  
Manual...\$14.95

OSI Expansions, conversions, and  
Floppy Disk Drive Maintenance  
\$35.00/hour — \$35.00 minimum

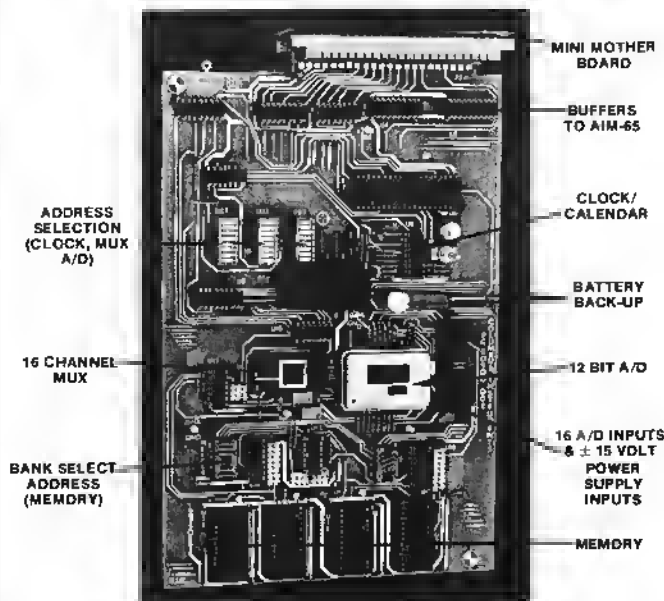
### COMPLETE SELECTION OF ELCOMP BOOKS

Soundustrial Electronics, Inc.  
4066 Polaris Avenue,  
Joshua Tree, CA 92252

(714) 366-9572

# AIM-65/SYM-PET-KIM-6800

Universal Interface Board Converts AIM-65/SYM  
Into Professional Data Logger



(Also connects to PET or KIM with adapter cable.  
Adaptable to other 6502 and 6800 systems)

### CONTAINS:

- ★ 12 bits, 16 channels, fast A/D converter
- ★ space for additional 16K RAM memory or 32K EPROM (or combination)
- ★ real time clock/calendar with real time interrupt capability and 10-year lithium battery backup
- ★ plugs directly into AIM-65 expansion connector with the help of a mini-mother board which supports up to three interface boards
- ★ supplied with supportive demonstration and control programs

### AVAILABLE MODELS:

- ★ IB-902 Additional Memory Space (only) .....\$ 390.00
  - ★ IB-902-A Calendar/Clock plus memory space.....\$ 690.00
  - ★ IB-902-B A/D (12 bits, 16 channels plus memory space) .....\$ 960.00
  - ★ IB-902-AB A/D, plus memory space and calendar/clock .....\$1,270.00
- Mini mother board to support up to three (3) interface boards .....\$65.00

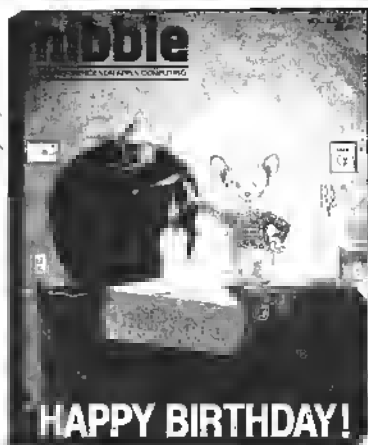
Quantity Discounts Available



COLUMBUS INSTRUMENTS INTERNATIONAL CORPORATION  
Supplier of individual instruments and total measuring systems

850 N. HAGUE AVE., COLUMBUS, OHIO 43204 U.S.A.  
PHONE: (614) 488-6176 TELEX: 246514

# "NIBBLE<sup>®</sup> IS TERRIFIC" (For Your Apple)



**NIBBLE IS:** *The Reference for Apple computing!*

**NIBBLE IS:** One of the Fastest Growing new Magazines in the Personal Computing Field.

**NIBBLE IS:** Providing Comprehensive, Useful and Instructive Programs for the Home, Small Business, and Entertainment.

**NIBBLE IS:** A Reference to Graphics, Games, Systems Programming Tips, Product News and Reviews, Hardware Construction Projects, and a host of other features.

**NIBBLE IS:** A magazine suitable for both the Beginner and the Advanced Programmer.

Each issue of NIBBLE features significant new Programs of Commercial Quality. Here's what some of our Readers say:

- "Certainly the best magazine on the Apple II"
- "Programs remarkably easy to enter"
- "Stimulating and Informative; So much so that this is the first computer magazine I've subscribed to!"
- "Impressed with the quality and content."
- "NIBBLE IS TERRIFIC!"

*In coming issues, look for:*

- ☐ Stocks and Commodities Charting ☐ Assembly Language Programming Column
- ☐ Pascal Programming Column ☐ Data Base Programs for Home and Business
- ☐ Personal Investment Analysis ☐ Electronic Secretary for Time Management
- ☐ The GIZMO Business Simulation Game

And many many more!

NIBBLE is focused completely on the Apple Computer systems.

Buy NIBBLE through your local Apple Dealer or subscribe now with the coupon below.

**Try a NIBBLE!**

**nibble**

Box 325, Lincoln, MA. 01773 (617) 259-9710

**I'll try nibble!**

**Enclosed is my \$17.50 (for one year).**  
**(Outside U.S., see special rates on this page.)**

☐ **check** ☐ **money order**

Your subscription will begin with the next issue published after receipt of your check/money order.

Name

Address

City

State  Zip

**NOTE**

First Class Air Mail is required for all APO, FPO and all foreign addresses with the following additional amounts:

- Europe \$32.00
- Mexico and Central America \$21.00
- South America \$32.00
- Middle East \$35.00
- Africa: North \$32.00
- Central \$43.00
- South \$43.00
- Far-East, Australia \$43.00
- Canada \$18.00

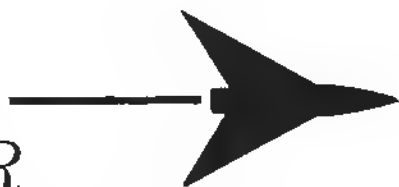
All payments must be in U.S. funds drawn on a U.S. bank.

© 1980 by MICRO-SPARC, INC., Lincoln, Mass. 01773. All rights reserved.

\*Apple II is a registered trademark of Apple Computer Company.



# SPEED POWER EFFICIENCY



for **OSI**  
65D3 SYSTEMS

## **FBASIC:** BASIC Compiler \$155/\$10

- **FAST** efficient machine code written with the ease of BASIC.
- **SPEED**-optimized, native-code compiler.
- **INTEGER** subset of OSI-supplied BASIC.
- **DISK** based: No problem with size of source or object files.
- **EXTENSIONS** to BASIC:
  - Simple interface to system hardware and software.
  - Direct access to 6502 registers.
  - Array initialization.
  - Optional absolute array locations.
  - WHILE and other structures.
  - Simple technique for combining compiler and interpreter advantages.
- **FULL** system: utilities (plus source), manual, and many useful examples.

## **R-EDIT:** Edit any program or text with ease! \$40

- **FULL CURSOR** control. Edit anywhere on the screen.
- **INSERT**, replace, add, delete.
- **ONE KEY** stroke and you're editing.
- **BASIC**, assembler, etc. can all be edited without reloading editor.
- **RAM-resident**: Always ready!
- **SYSGEN** relocates R-EDIT and customizes.

## **SPUL-65:** Printer Spooler \$95/\$10 Virtual Indirect File

- **STOP WAITING** for your printer!
- **PROCESS** words, write programs...all while printing!
- **QUEUE** lets you pile on print jobs.
- **MULTIPLE COPIES** printed with top and bottom page margins.
- **SYSGEN** relocates SPUL65 and gives extensive customization.
- **INDIRECT FILE** commands produce disk files giving you:
  - A virtually unlimited temporary file.
  - A link between incompatible files; for example, use WP-2 for extensive BASIC editing.
  - Ability to merge multiple program segments.

## **XREF:** BASIC Cross Referencer \$25

- **TABULATES:**
  - Referenced line numbers.
  - Variable names (numeric, string, array).
  - Defined functions.
- **FAST** machine language program.
- **DISK** based: Handles large BASIC source files on any drive.

## **CP/M to OSI** Disk Translation

Frustrated by all those good CP/M disks that won't run on your OSI CP/M system? It's that special OSI disk format! And we can fix that. Just send us your disk, \$15, and you'll soon have an OSI compatible disk.



Dafa Resource Corporation  
Suite 204  
1040 Lunalai Street  
Kailua, HI 96734 (808) 261-2012

Manual orders applied to software purchases. Programs supplied on 8-in, single-density, single-sided disks. Hawaii residents add 4% tax.

# Recursive Use of GOSUB in Microsoft BASIC

The concept of recursion, or repeatedly calling a routine from within itself, can make the coding of an algorithm much more efficient and elegant. Here, the use of recursion is explored within a Microsoft BASIC environment. The OSI implementation discussed here is portable to Apple, PET, TRS-80 Color, and other Microsoft BASIC computers.

in successive locations on the stack and an orderly return back to the first level is possible.

## Successive Calls: Recursion

Two questions present themselves immediately: why would you want to call a subroutine again before it has finished its task? And, if convinced that this was desirable, how can it be done?

To answer these questions in reverse order, a subroutine may call itself in certain circumstances. A skeleton example will illustrate this point:

```
10 get data, set up parameters
20 GOSUB 100
30 output results
40 either STOP, or GO to 10
100 If (condition) THEN (state-
    ment): RETURN
110 GOSUB 100
120 process results
130 RETURN
```

This skeleton can readily be developed into a workable program in such languages as ALGOL, Pascal, and, of particular interest here, Microsoft (OSI, Apple, PET, SYM, TRS-80 Color) BASIC. The ability of a subroutine to call itself is called *recursion* and is allowed in the languages mentioned above. Recursive calls, as in line 110 above, are explicitly disallowed in all versions of FORTRAN that I know of.

## Example Programs Using Recursion

Probably the classic example of a recursive subroutine is that for calculating  $N$  factorial. To refresh your memory,  $N$  factorial, written  $N!$ , is defined for positive integers as  $N(N-1)(N-2) \dots 1$ .  $0! = 1$ . When  $N < 0$ , or  $N$  non-integral, then  $N!$  is undefined. Listing 1 illustrates the use of recursion for calculating  $N!$ . The subroutine begins on line 100. You can see that this example meets all the conditions given

in the skeleton listing above. By running this program with various values of  $N$  as input, you'll see that an OM (out of memory) error occurs on the OSI when  $N = 25$ . Yet, PRINT FRE (x) gives a large positive number. The conclusion to be drawn from this is that stack overflow occurs after 24 recursive calls, even though there is really plenty of unused memory.

The program in listing 1 is, admittedly, a poor way to calculate factorials when a FOR-NEXT loop would be much easier. It is included solely to illustrate the use of a recursive subroutine in a way that is simple to trace through. Listing 2 gives a program which generates all possible permutations of a set of characters that are read in. (This listing illustrates the genesis of this article. I wanted to generate all possible anagrams from a given set of letters — the resulting program is given in listing 2.) In this case, recursion represents an easy way to generate the required permutations for any size array. If the size of the array is exactly three, all permutations are generated and printed in subroutine 590 without recursion. If the size of the array is four, then four calls to subroutine 590 are generated. For instance, if the original array is ABCD, the four sets of results are A(BCD), B(ACD), C(ABD) and D(ABC) where (ABC) represents all six possible permutations of A, B, and C. If the array size is larger than four, the subroutine works similarly. That is, in each step the size of the array is reduced by one and the subroutine is called again recursively. Figure 1 gives the results of a permutation of four characters. In the first example, all four are distinct, while in the second case there is one set of duplicate letters and the number of permutations is therefore cut in half.

The principle that is illustrated in each of these listings is generally valid: the recursive subroutine examines some

Rolf B. Johannesen  
13917 Congress Drive  
Rockville, Maryland 20853

A subroutine is a group of statements which may be called repeatedly by a main program or by another subroutine. If it is called only once it should not be a subroutine, but rather, coded in line. A subroutine may have no arguments (e.g. a subroutine to generate carriage return — line feed), or may have one or more arguments which are changed with each call (e.g. SIN (x)).

For the subroutine to return to the calling program after it has finished, it must be given a return address by the calling program. This return address must be saved until it is needed. The mechanism of doing this is provided in the particular machine used, down to the hardware level, and is of concern to the programmer only under the following condition: if the return address is stored in a fixed location, a second call to the subroutine (before it has finished its task) will cause the return address to be overwritten and an eventual return to the original calling program will become impossible — disaster! However, if the return address is stored on a stack, then subsequent calls to the subroutine will cause the return addresses to be stored

variable. If it is small enough ( $N = 1$  in listing 1, or  $N = 3$  in listing 2), then the solution is calculated at once. If the variable examined is too large to allow immediate solution, then it is reduced by one and the subroutine calls itself recursively. Upon return, the variable is incremented again and any necessary calculations are done on the returned values.

Listing 2 illustrates the use of a software stack in lines 380-400 and 480-510. It is necessary to generate the equivalent of a FOR...NEXT loop in cases where  $N > 3$ . However, a simple loop cannot be used or the loop variable would be written over when the subroutine was called recursively. Hence, we assign a variable stack pointer SP and use arrays NN and NS to hold the loop counters and the final values they are tested against respectively. If you follow the code you'll see that if  $N = 3$ , SP, NN and NS are never used. If  $N = 4$ ,  $SP = 1$ , and in general  $SP = N - 3$  where N is the original number of characters read in. To produce all possible permutations of seven characters requires about 13½ minutes on my OSI C1P machine. I have entered an array of eight characters and the results appear to start out correctly, although I have not waited for the run to finish.

The conversion from ASCII in line 80 should not be required. However, the initial version of this program used A\$ as a character array exactly as A is used in listing 2. Unfortunately, the program would only run for a few cycles before breaking down and filling my original array with repetitions of the same character. This behavior is probably related to the well-known string array bug in this machine. In any case, the present version appears to be bug-free for strings up to at least eight characters in length.

Rolf B. Johannesen has worked as a chemist at the National Bureau of Standards in Washington, D.C. and Gaithersburg, Maryland since 1951. He was introduced to FORTRAN programming in 1965, and has since programmed in many languages, both high-level and assembly. He has a KIM-1 and an OSI C1P with 8K BASIC in ROM plus 8K RAM.

Editor's note: This article is not affiliated with Mr. Johannesen's place of employment.

#### Listing 1

```
10 INPUT "ENTER N";N
20 IF N<0 OR INT(N)<N THEN 60
30 GOSUB 100
40 PRINT N;"FACTORIAL =" ;F
50 GOTO 10
60 PRINT N;"FACTORIAL UNDEFINED"
70 GOTO 10
100 IF N=1 OR N=0 THEN F=1:RETURN
110 N=N-1
120 GOSUB 100
130 N=N+1
140 F=F*N
150 RETURN
```

#### Listing 2

```
10 REM PERMUTATION ROUTINE
20 REM ILLUSTRATES RECURSIVE USE OF GOSUB
30 REM AUTHOR - ROLF B. JOHANNESSEN
40 REM LAST REVISION 20 JAN 81
50 INPUT N$
60 L=LEN(N$)
70 FOR I=1 TO L
80 A(I)=ASC(MID$(N$, I, 1))

90 NEXT I
100 REM PERMUTE NUMERIC VALUES OF CHARACTERS
110 REM IF STRING LENGTH>10, A MUST BE DIMENSIONED
120 REM (NOTE: THERE ARE 3628800 PERMUTATIONS OF
130 REM TEN DIFFERENT OBJECTS!)
140 N=L
150 REM INITIALIZE POINTERS AND COUNTERS
160 SP=0:PS=0:K=0
170 GOSUB 970:REM SORT ARRAY INTO ASCENDING ORDER
180 GOSUB 270:REM FIND THE PERMUTATIONS
190 REM IF ONE OR TWO PERMUTATIONS LEFT OVER,
    PRINT BEFORE GETTING NEXT

200 ON PS GOTO 220,230
210 GOTO 50:REM GET NEXT STRING
220 PRINT TAB(2);X$:GOTO 50
230 PRINT TAB(2);X$:SPC(1);Y$:GOTO 50
240 REM
250 REM
260 REM
270 REM SUBROUTINE PERMUTE
280 REM THIS SUBROUTINE DOES THE WORK
290 REM STARTING FROM THE RIGHT, TRANSPOSE AND

300 REM WORK TO LEFT UNTIL ALL POSSIBLE TRANSPOSITIONS
310 REM (PERMUTATIONS) HAVE BEEN DONE
320 IF N=3 THEN GOSUB 590 : RETURN
330 REM PERMUTE 3 OBJECTS AND PRINT
340 REM SORT INTO ASCENDING ORDER
350 GOSUB 970
360 REM IF N>3 THEN INCREMENT STACK POINTER (SP)
370 REM COUNT DOWN ON N, AND CALL PERMUTE AGAIN
380 SP=SP+1
390 NS(SP)=N:REM HERE IS A FOR-NEXT LOOP

400 NN(SP)=1:REM WITH NN AS LOOP VARIABLE
410 N=N-1:REM AND NS AS FINAL VALUE
420 GOSUB 270:REM RECURSIVE CALL WITH N DECREMENTED BY ONE
430 REM DO NOT PERMUTE IDENTICAL OBJECTS
440 IF A(L-N)=A(L-NN(SP)+1) THEN 540
450 T=A(L-N):A(L-N)=A(L-NN(SP)+1):A(L-NN(SP)+1)=T
460 REM SWAP ABOVE IS NEXT STEP IN PERMUTATION
470 REM AFTER RIGHTMOST GROUP OF 3 HAS BEEN PERMUTED
480 IF NN(SP)<NS(SP) THEN NN(SP)=NN(SP)+1:GOTO 420
490 SP=SP-1
500 REM BACK UP THE STACK
510 N=N+1:REM AND COUNT UP ON N
520 RETURN:REM REACHES HERE EVENTUALLY
530 REM NEXT INCREMENT LOOP COUNTER IF AN IDENTICAL
    PAIR IS FOUND
```

(Continued)

# Listing 1 (Continued)

```

540 IF NN(SP)<NS(SP) THEN NN(SP)=NN(SP)+1
      :GOTO 440
550 GOTO 490
560 REM
570 REM
580 REM
590 REM SUBROUTINE PERMUTE3
600 REM WHEN N=3 THIS ROUTINE IS CALLED
610 GOSUB 870:REM SORT 3 IN ASCENDING ORDER
620 REM SET UP PRINT OF CURRENT PERMUTATION
630 W$=CHR$(A(1))

640 FOR I=2 TO L
650 W$=W$+CHR$(A(I))
660 NEXT I
670 ON PS GOTO 700,710
680 REM FALLS THROUGH IF PS=0
690 X$=W$:GOTO 730
700 Y$=W$:GOTO 730
710 PRINT TAB(2);X$;SPC(1);Y$;SPC(1);W$
720 PS=FRE(0):PS=-1
730 PS=PS+1
740 REM CHECK IF PERMUTE IS FINISHED
750 IF A(L-2)=A(L-1) AND A(L-1)=A(L) THEN 830
760 IF A(L)<A(L-1) THEN 790
770 T=A(L):A(L)=A(L-1):A(L-1)=T
780 GOTO 630
790 IF K=2 THEN 830
800 IF A(L-2)=A(L-K) THEN K=K+1:GOTO 790
810 T=A(L-2):A(L-2)=A(L-K):A(L-K)=T
820 K=K+1:GOTO 770
830 K=0 : RETURN
840 REM
850 REM
860 REM

```

```

870 REM SORT ROUTINE
880 REM SORTS LAST N ITEMS OF ARRAY A
890 REM OF LENGTH L IN ASCENDING ORDER
900 FOR IA=L-N+1 TO L-1
910 S=A(IA)
920 IB=IA
930 FOR IC=IA+1 TO L
940 IF A(IC)<S THEN 970
950 S=A(IC)
960 IB=IC
970 NEXT IC
980 IF IB=IA THEN 1000
990 A(IB)=A(IA):A(IA)=S
1000 NEXT IA
1010 RETURN

```

Figure 1

OK	RPTA RTAP RTPA
RUN	TAPR TARP TPAP
? TRAP	TPRA TRAP TRPA
APRT APTR ARPT	? DOOR
ARTP ATPR ATRP	DOOR DORO DROO
PART PATR PRAT	ODOR ODRO OODR
PRTA PTAR PTRR	OORD ORDO OROD
RAPT RATP RPAT	RDOO RODO ROOD

MICRO

# EOITRIX + GRAPHTRIX

**EOITRIX + GRAPHTRIX = THE MOST POWERFUL WORD PROCESSOR  
THIS SIDE OF A NEWSPAPER COMPOSITION ROOM**

## EOITRIX™ TEXT EDITOR

**EASY TO USE**

- Friendly, COMPLETE instructions that you or your secretary can understand.
- Easy to remember 1 or 2 keystroke commands.
- Fully Menu Driven.

**POWERFUL**

- Full Cursor Control.
- Full Print Size and Emphasis Control.
- Underline - Superscript - Footnotes.
- Search - Replace - Block Move.
- Automatic Graphic Insertion and Formatting.
- All Justify Modes and Full Margin Control.

**FLEXIBLE**

- 40 or 80 Column Display.
- Printout through GRAPHTRIX to 11 different Printers WITHOUT CHANGING YOUR TEXT FILE!

**REQUIRES:** Apple II with 48K, Applesoft in ROM, DOS 3.3 and the GRAPHTRIX Matrix Graphics System

## GRAPHTRIX™ TEXT PRINTER AND GRAPHICS SCREEN DUMP

**EASY TO USE**

- Complete READABLE documentation.
- Fully Menu Driven.
- Self-running Introduction and Demonstration.

**POWERFUL**

- Graphic Magnification, Normal/Inverse, Page Centering, HI and Low Crop Marks, Title String.
- Automatic Formatting of Graphics in your Document.
- Print Size, Emphasis, Underline, Superscript, Footnotes, Chapters, controlled from your text file.

**FLEXIBLE**

- Prints ANY HI-RES Graphic your Apple II can create.
- Formats Text files from Applewriter OR EDITRIX.
- Use as a Menu Driven Screen Dump OR from in YOUR OWN Applesoft Program.
- Compatible with 11 different Matrix Line Printers AND 7 different Parallel Interface Cards.

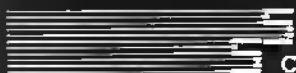
**REQUIRES:** Apple II with 48K, Applesoft in ROM, DOS 3.3 and one of the following line printers: EPSON MX-70/MX-80/MX-100, ANADIX 9500/9501, IDS 440G/445G/460G/560G, CENTRONICS 739, MPI 88G, SILENTYPE.

FROM DATA TRANSFORMS, INC., THE GRAPHICS LEADER

EDITRIX and GRAPHTRIX are the trademarks of Data Transforms Inc., a division of Sociometrics Inc.  
Apple II and Applesoft are trademarks of Apple Computer Inc.  
© Copyright 1981 Data Transforms, Inc. 806 E. Fifth Ave. Denver, CO 80218 (303) 722-6774  
All Rights Reserved.



*Play Copts & Robbers  
In The Tombs Of Ancient Egypt*

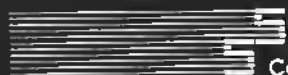


Copyright 1981 By Sirius Software, Inc.





***Where your secret weapon  
is the fourth dimension...***



Copyright 1981 By Sirius Software, Inc.

The cover art for Orbitron features a dark, starry space background. A large, thin white circle is centered in the upper half. Inside this circle, the word "ORBITRON" is written in a bold, white, sans-serif font, with horizontal lines above and below the text. Surrounding the central circle are several smaller, bright star-like objects, each with a crosshair pattern. The overall aesthetic is retro and sci-fi.

# ORBITRON

In the center of an orbiting space station you are protected only by a revolving force shield. Enemy forces are advancing from all directions and begin to place killer satellites in orbit around your station. And then, look out for the meteors!

Copyright 1981 By Sirius Software, Inc.

A "bloody" good game for the true-blue game freak. Your mission in this exploratory operation is to deliver whole blood to Hemophilia, a city in the sky, and return to Anemia Base before the Gamma Goblins overcome you. A real heart stopper!

Copyright 1981 By Sirius Software, Inc.

The cover art for Gamma Goblins features a dark background with several white stars. The title "GAMMA GOBLINS" is written in a large, stylized, white font that is slightly tilted. Below the title, there is a small illustration of a rocket ship flying towards the right. In the bottom right corner, there is a small, detailed illustration of a city or base with various structures and a dome. The overall aesthetic is retro and sci-fi.

# GAMMA GOBLINS

BY TONY AND BENNY NGO - A PRODUCT OF SIRIUS SOFTWARE, INC.



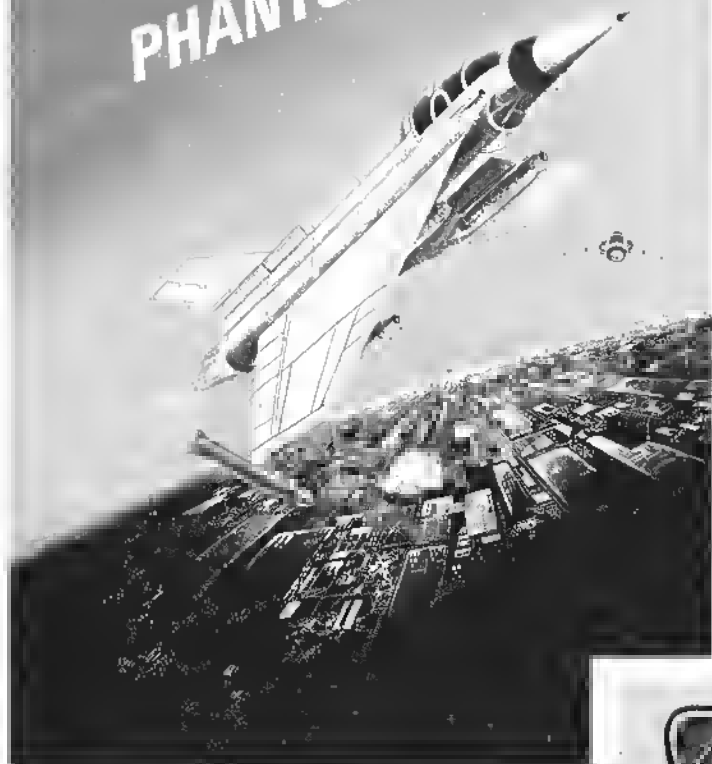
*What say we go out and stomp a few???*

Endless Excitement Stomping Sneakers And A Swarm Of Other Creatures



Copyright 1981 By Sirius Software, Inc.

# PHANTOMS FIVE



Phantoms Five simulates a fighter-bomber mission in real time, three dimensional color graphics. While you try to make your bombing run, you have to avoid being hit by anti-aircraft fire and fight off enemy aircraft as well.

Copyright 1980 By Sirius Software, Inc.

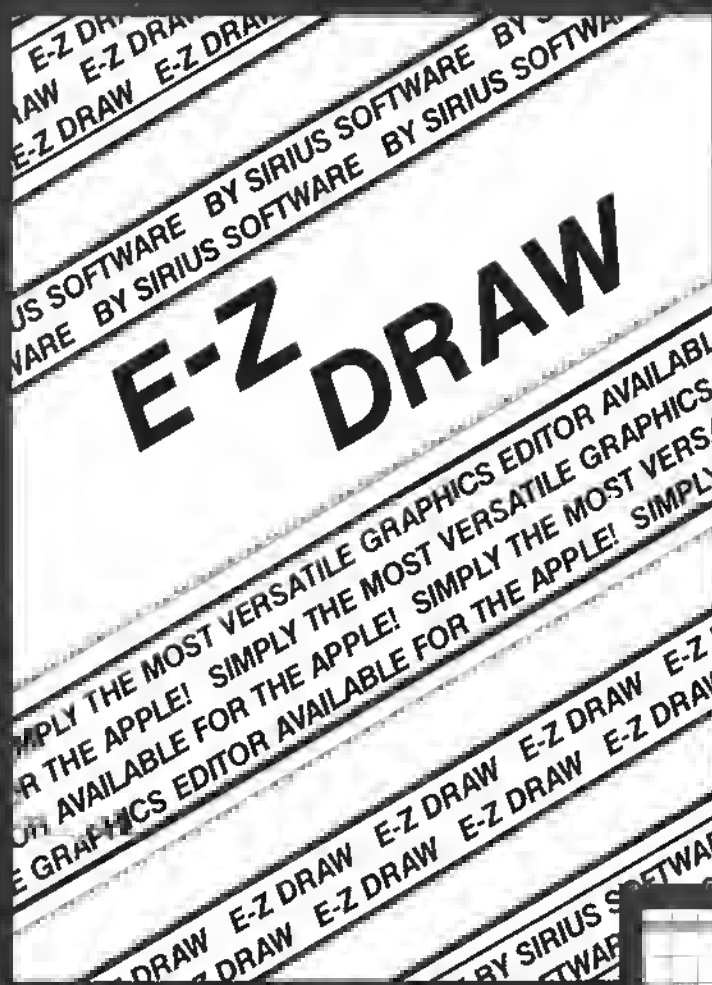
# space eggs

Hatch some fun with the Spiders, Wolves, Lips, and Fuzzballs. Space Eggs will crack you up! Each package includes a multi-color T-shirt iron-on that says "I FRIED THE SPACE EGGS."

Copyright 1981 By Sirius Software, Inc.



"It Will Crack You Up"



This is the graphics editing package we based our business on. Includes the Higher Text Character Generator by Ron & Darrell Aldrich and over 20 original and imaginative type styles.

Copyright 1980 By Sirius Software, Inc..

The professional graphics editing package for use within the Pascal environment.

Copyright 1981 By Sirius Software, Inc.

02D00073

A Product Of Sirius Software, Inc.

**Pascal  
Graphics  
Editor**

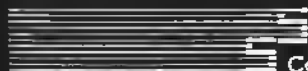
**PGE**





# GORGON is here...

THE EARTH HAS ENTERED A TIME WARP . . . AND THE BATTLE HAS JUST BEGUN



Copyright 1981 By Sirius Software, Inc.

# BOTH BARRELS

# STAR CRUISER

# CYBER STRIKE

# AUTOBAHN

# PULSAR II

A two game pack featuring "High Noon" and "Duck Hunt" You'll love the bad guy that falls off the roof and the dogs fighting over the ducks. Fun for the young and the young at heart.

Copyright 1980 By Sirius Software, Inc.

Save yourself from the swooping aliens! This is a fast action arcade style game that can be played from ages three and up, but beware, the difficulty increases with each new wave of aliens.

Copyright 1980 By Sirius Software, Inc.

Interstellar challenge for the dedicated arcade gamer. You are in command of a light transport ship equipped with Hyperspace Drive, Antimatter Torpedoes, Local and Galactic Sensors, Meteor Shields, and an Instrument Panel which continually tabulates all information vital to your mission. You alone can prevent the clone take over of the allied settlement bases. WARNING... this game requires practice to play successfully.

Copyright 1980 By Sirius Software, Inc.

Hatr raising excitement at 120, 160, and 200 kilometers per hour! Drive through heavy traffic, oil slicks, narrow roads, and dark tunnels (with headlights). Watch out for the fire trucks! Only on the Autobahn can you drive this fast.

Copyright 1981 By Sirius Software, Inc.

A unique two game series that provides scoring options for separate or combination game play. To destroy the "Pulsar" is no easy task. It is surrounded by spinning shields that send out orbs of energy aimed directly at you. "The Wormwall" places you in one of the strangest mazes ever created. The walls do not connect. Openings only occur temporarily as moving colored segments in the walls cross. In addition, there are munching mouths in each level of the maze ready to gobble you up should you misjudge the time and location an opening will occur.

Copyright 1981 By Sirius Software, Inc.

Contact Your Local Computer Dealer For More Information • Dealer Inquiries Invited



## Sirius Software, Inc.

2011 Arden Way #2, Sacramento, California 95825

**PROGRAMMING:** Cops & Robbers was programmed by Alan Merrell and Eric Knopp. Epoch was programmed by Larry Miller. Orbiron was programmed by Eric Knopp. Gamma Goblins was programmed by Tony and Benny Ngo. E-Z Draw was programmed by Nasir Gebelli and Jerry W. Jewell. Pascal Graphics Editor was programmed by Ernie Brock. Sneakers was programmed by Mark Turmell. Gorgon, Phantoms Five, Space Eggs, Both Barrels, Star Cruiser, Cyber Strike, Autobahn, and Pulsar II were programmed by Nasir.

**COPYRIGHT INFORMATION:** All software mentioned in this advertisement are copyrighted products of Sirius Software, Inc. All rights re-

served. Apple and Applesoft are registered trademarks of Apple Computer Inc. Higher Text is a copyrighted product of Synergistic Software. We use Control Data disks for highest quality.

**SYSTEM REQUIREMENTS:** All software mentioned in this advertisement require an Apple II or II+ with 48K with the following exceptions: E-Z Draw requires a 48K Apple with Applesoft in ROM (or a 64K Apple II or II+). Pascal Graphics Editor requires an Apple II or II+ with Language System.



subroutine. However, if you know at the start of program writing that you're going to use Hi-Res plots, the actual colors to be used and location of points are important. For example, a smooth and continuous plot of a function is difficult to achieve in any color except white. Even given that function limits are known and white is to be used, smooth plots are not guaranteed unless small step sizes are used along a coordinate. In the first three cases of the program, relative functions were used so that Hi-Res y-coordinates were used in the main program. The figure is symmetric, therefore the mirror image of one side is calculated in a subroutine.

The case loop extends from line 10 through 230. Each case is simply a different color scheme using the same figure. The figure was broken into fourteen separate pieces, P1 through P14. Liberal use of different mathematical functions was made for each section, although simpler functions were possible for smaller sections.

The routine from line 300 through 360 displays titles for each case. Lines 400 through 490 plot solid blocks above and below the vase figure.

The routine from line 500 through 575 calculates actual x-coordinates using the function defined outside the routine. Case 2 plots an entire white and blue horizontal line. Note the end-point changes necessary to prevent black spaces at the end-points.

Case 4 extends from line 235 through 290. In this example, x-coordinate values for a circle, and spirals within the circle, are multiplied by 1.0833 to give a better display on the CRT. Without this factor, the circle drawn by line 245 is obviously non-circular, no matter how much the television is adjusted. The factor 1.0833, or 13/12, is not exact, but is easily remembered. The factor appears again in lines 255 and 265. The point plotted at line 255 and erased at line 275 serves as an angle indicator as the spirals get denser. As this case is quite time-consuming, the bell is sounded repeatedly as soon as the plot is completed to alert those who have tired of watching. The screen is cleared when a key is pushed in response to the 'GET C\$' at line 290.

The entire program is less than 2048 bytes long, which is comparable to the storage needed for the many data statements required to define the figure. Also, the programming was easier than a long list of data statements and probably contained fewer errors.

```

0 REM *****
1 REM *
2 REM * FIGURE PLOTTER *
3 REM * PRUETZ *
4 REM *
5 REM * LISTING 1 *
6 REM *
7 REM *****
8 REM

9 PI = 3.1415926536:XC = 140
10 FOR CASE = 1 TO 3: GOSUB 300: HGR2 : GOSUB 400: HCOLOR= 3
11 IF CASE = 1 THEN HPLLOT 70,10 TO 210,10
20 YA = 10:YB = YA + 15:KA = 70:KB = PI / 10:KC = 10
25 DEF FN F(Y) = KA + 6 * SIN (KB * (Y - KC))
30 GOSUB 500: REM P1
40 YA = YB:YB = YA + 5:KA = - 1:KB = 89
45 DEF FN F(Y) = KA * Y + KB
50 GOSUB 500: REM P2
60 YA = YB:YB = YA + 5:KA = - .4:KB = 71
65 GOSUB 500: REM P3
70 YA = YB:YB = YA + 5:KA = 0:KB = 57
75 GOSUB 500: REM P4
80 YA = YB:YB = YA + 40:KA = 57:KB = PI / 160:KC = 40
85 DEF FN F(Y) = KA * COS (KB * (Y - KC))
90 GOSUB 500: REM P5
100 YA = YB:YB = YA + 20:KA = FN F(YA):KB = 5:KC = 1 / 10
105 KA = KA - KB
110 DEF FN F(Y) = KA + KB * EXP ( - KC * (Y - YA))
115 GOSUB 500: REM P6
120 YA = YB:YB = YA + 5:KA = 1:KB = - 66
125 DEF FN F(Y) = KA * Y + KB
130 GOSUB 500: REM P7
135 YA = YB:YB = YA + 10:KA = - 1:KB = 143
140 GOSUB 500: REM P8
145 YA = YB:YB = YA + 3:KA = 0:KB = 28
150 GOSUB 500: REM P9
155 IF CASE = 1 THEN HPLLOT 107,YB TO 112,YB: HPLLOT 168,YB TO 173,YB
160 YA = YB:YB = YA + 3:KB = 33
165 GOSUB 500: REM P10
170 YA = YB:YB = YA + 2:KA = 1:KB = - 88
175 GOSUB 500: REM P11
180 YA = YB:YB = YA + 2:KA = - 1:KB = 158
185 GOSUB 500: REM P12
190 YA = YB:YB = YA + 5:KA = 0:KB = 33
195 GOSUB 500: REM P13
200 YA = YB:YB = YA + 40:KA = 53:KB = 20:KC = PI / 40
205 DEF FN F(Y) = KA - KB * COS (KC * (Y - YA))
210 GOSUB 500: REM P14
215 IF CASE = 1 THEN HPLLOT 67,YB TO 213,YB
220 GOSUB 450
225 FOR D = 1 TO 3600: NEXT D
230 NEXT CASE
235 GOSUB 300: HGR2 : HCOLOR= 3
240 XC = 140:YC = 91:RC = 86:RI = 90:XF = 1.0833
245 FOR T = 0 TO 2 * PI STEP PI / 360:X = XF * RC * COS (T):Y = RC * SIN
(T): HPLLOT XC + X,YC + Y: NEXT T
250 FOR A = 1 TO 4 STEP .075: FOR V = 0 TO (3 + A) * PI STEP PI / (8 * A
* A):CV = COS (V):SV = SIN (V)
255 HCOLOR= 3:XI = XC + XF * RI * CV:YI = YC + RI * SV: HPLLOT XI,YI
260 P = A * V
265 XP = XC + XF * P * CV:YP = YC + P * SV
270 HPLLOT XP,YP
275 HCOLOR= 0: HPLLOT XI,YI
280 NEXT V: NEXT A
285 BS = CHR$ (7):BS = BS + BS:BS = BS + BS: PRINT BS,BS,BS,BS
290 GET C$
295 TEXT : END
300 TEXT : HOME : VTAB 12
305 ON CASE GOTO 310,320,330,340
310 HTAB 14: PRINT "VASE OUTLINE"
315 GOTO 350
320 HTAB 15: PRINT "LYIN' VASE": PRINT
325 HTAB 11: PRINT "(OPPOSED PROFILES)": GOTO 350

```

(Continued)

# Listing 1 (Continued)

```

330 HTAB 16: PRINT "VASELINE"
335 PRINT : HTAB 15: PRINT "(BOTTLE OF)"; GOTO 350
340 HTAB 10: PRINT "PURE PETROLEUM JELLY"
345 PRINT : HTAB 9: PRINT "(SPIRAL OF ARCHIMEDES)"
350 FOR D = 1 TO 3000: NEXT D
360 RETURN
400 ON CASE GOTO 435,405,425
405 HCOLOR= 2
410 FOR Y = 0 TO 9: HPLLOT O,Y TO 279,Y: NEXT

415 RETURN
425 HCOLOR= 1
430 FOR Y = 0 TO 9: HPLLOT 67,Y TO 213,Y: NEXT
435 RETURN
450 ON CASE GOTO 490,455,460
455 HCOLOR= 2: GOTO 470
460 HCOLOR= 1
470 FOR Y = YB + 1 TO 191
475 HPLLOT O,Y TO 279,Y
480 NEXT
490 RETURN
500 FOR Y = YA TO YB
505 XF = FN F(Y)
510 XL = XC - XF:XR = XC + XF
515 ON CASE GOTO 520,525,545
520 HPLLOT XL,Y: HPLLOT XR,Y: GOTO 550
525 HPLLOT O,Y TO XL,Y: HPLLOT XR,Y TO 279,Y
530 IF XL < > 2 * INT (XL / 2) THEN XL = XL + 1
535 IF XR < > 2 * INT (XR / 2) THEN XR = XR - 1
540 HCOLOR= 2: HPLLOT XL,Y TO XR,Y: HCOLOR= 3: GOTO 550
545 HPLLOT XL,Y TO XR,Y
550 NEXT Y
555 RETURN

```

# OSI \*NEW\* OSI

## Star ZAP!

ENEMY SHIPS HAVE SURROUNDED YOUR SPACE STATION, FIRING DEADLY TORPEDOS IN AN ATTEMPT TO BREAK DOWN YOUR SHIELDS AND DESTROY THE STATION! YOU'VE GOT TO ROTATE YOUR LASER TURRET AND FIRE QUICKLY, ESPECIALLY WHEN THEY ATTACK FROM ALL FOUR QUADRANTS AT ONCE! THEN, WITHOUT WARNING, AN ORBITING BOMBER SPIRALS IN! CAN YOU ROTATE AND GET HIM BEFORE HE CRASHES INTO YOU? STAR ZAP! IS ANOTHER PAST ARCADE GAME FROM JOHN WILSON. WITH COLOR AND SOUND, 8K CASSETTE ONLY. ....\$9.95

## STARGATE GUNNER

THE MARAUDERS WHO HAVE BEEN HARASSING INTERSTELLAR SHIPPING HAVE BEEN DETECTED USING THE STARGATE IN YOUR SECTOR. THE SPACE DEFENSE DIRECTORATE HAS ORDERED YOU TO DESTROY ANY SHIPS TRYING TO ESCAPE THROUGH THE STARGATE, USING YOUR X-Y RANGING ENERGY CANNON, YOU MUST STOP THESE PIRATES- BUT WATCH OUT! ANY SHIPS WHICH SLIP THROUGH THE STARGATE COUNT HEAVILY AGAINST YOU! C&S, 8K, \$9.95

## WHEEL OF FORTUNE

THE SECOND IN THE PRETZELANO LINE OF EDUCATIONAL SOFTWARE. A HIDDEN WORD IS DISPLAYED BEHIND BOXES AND YOU MUST TRY TO GUESS THE WORD. EACH LETTER HAS A POINT VALUE DETERMINED BY SPINNING THE WHEEL OF FORTUNE. IF THE LETTER YOU GUESS IS IN THE WORD, YOU GET THE POINTS. MORE THAN JUST A FUN AND CHALLENGING GAME, THIS PROGRAM COMES IN TWO VERSIONS ON THE SAME TAPE! ONE SIDE IS A VOCABULARY BUILDER FOR GRADE SCHOOL STUDENTS WITH WORDS SELECTED FROM THE EDUCATOR APPROVED "DOLCH BASIC SIGHT VOCABULARY", AND FOUND IN BOOKS ON ALL SCHOOL SUBJECTS. THE OTHER SIDE HAS STUMPERS FOR THE ADULTS IN THE FAMILY. WITH INSTRUCTIONS FOR ADDING YOUR OWN WORDS TOO! 8K CASSETTE WITH SOUND. \$8.95

**Introductory Offer:** EXPIRES 1/20/82



BUY 2 OR MORE OF THESE NEW SOFTWARES AND TAKE A \$1.00 DISCOUNT ON EACH!

OR, SEND \$1.00 FOR ILLUSTRATED CATALOG AND GET A \$1.50 CREDIT GOOD ON YOUR FIRST ORDER!

ALL PROGRAMS AVAILABLE ON CASSETTE ONLY

**Pretzels and Software**

2005 D WHITTAKER RD.

YPSILANTI, MI. 48197

## Shorthand for Cursor Control

Kerry Lourash  
1220 North Dennis  
Decatur, Illinois 62522

All addresses in the table should be filled with zeroes except for the twenty command addresses listed in figure 1. If you like, you can restore Wever's original table or make your own.

Changes to the cursor control program are minimal. The ESC command of the CC is changed to "CTRL W." The PATCH option in the CC input routine is changed so that it jumps to the shorthand routine.

From the first moment I saw Henk Wever's program for a BASIC command "shorthand" (24:25, or *Best of Micro*, Vol. 3), I wanted to incorporate it into my cursor control program (MICRO 36:75). Wever's program allows C1P owners to print a BASIC command, such as GOSUB or RIGHT\$, by hitting only two keys.

Here's an adaptation with a small improvement that adds a "'" after the string commands. I reduced the number of commands from 68 to 20 (see figure 1), since I don't see much advantage in typing (and remembering!) two keys for one-, two-, or three-letter commands.

Enter the shorthand routine by hitting the ESC key. The cursor will change from a halftone to a white square, indicating that a command key should be input. Hit the desired command key and the command will be printed on the screen. If you should accidentally hit a key that doesn't correspond to a command, the routine waits for another key.

Figure 1: Shorthand Commands

Address	Contents	Command	Key
\$0282	(4E)	NEXT	N
\$0283	(44)	DATA	D
\$0284	(49)	INPUT	I
\$0286	(52)	READ	R
\$0288	(47)	GOTO	G
\$028C	(3E)	GOSUB	>
\$028D	(3C)	RETURN	<
\$0293	(20)	LOAD	"space"
\$0294	(53)	SAVE	S
\$0296	(3A)	POKE	:
\$0297	(3F)	PRINT	?
\$0299	(4C)	LIST	L
\$029C	(54)	TAB(	T
\$02A0	(2D)	THEN	—
\$02BB	(50)	PEEK(	P
\$02BD	(2F)	STR\$(	/
\$02C0	(43)	CHR\$(	C
\$02C1	(39)	RIGHT\$(	)
\$02C2	(38)	LEFT\$(	(
\$02C3	(4D)	MID\$(	M

The shift key is not used for GOSUB, RETURN, RIGHT\$(, and LEFT\$(. \$0280-02C3 should contain zero, except for the addresses above.



Change the contents of these addresses:

\$1E10 (12) to 22  
\$1E11 (1E) to 02  
\$1E5D (1B) to 17

Since I'm a thrifty sort of person, I couldn't abide the empty space at the end of page two. I managed to squeeze another routine in the space from \$02C4-\$02FF. This program, the CC Lister, LISTS 23 screen lines of BASIC code at a time. At the end of each set of 23 lines, you can choose to see another 23 lines by hitting the space bar. Any other key returns you to the immediate mode.

To guard against the Lister butting in when you save a program, the program checks the SAVE flag before going into action. Lister can also be defeated by typing a command before the LIST command, such as "PRINT: LIST." The contents of two addresses must be changed in the cursor control program:

\$1EF0 (A8) to C4  
\$1EF1 (1F) to 02

If you already have a favorite routine at \$0222, you could relocate these routines to the top of RAM and put the cursor control program just below them. The CC setup routine will keep them from being erased.

```
*****
;*
;* CC LISTER ROUTINE *
;*
;* BY K. LOURASH *
;*
*****
```

```
RTN EQU $1FA8
XIT EQU $1FEF
```

```
ORG $2C4
```

```
02C4 A80502 LDX $205 ;CHECK SAVE FLAG
02C7 D01D BNE CONT
02C9 A613 LDX $13 ;IS LIST STARTING?
02CB E099 CPX #$99
02CD D006 BNE FLAG ;NO, CHECK LIST FLAG
02CF A017 LDY $17 ;SET LINE COUNTER
02D1 8414 STY $14
02D3 B613 INC $13 ;TURN ON LIST FLAG
02D5 E09A FLAG CPX #$9A ;IS LIST FLAG ON?
```

```
*****
;*
;* CC SHORTHAND *
;* BY K. LOURASH *
;*
*****
```

```
TABL EQU $280
PATCH EQU $1ECF
```

```
ORG $222
```

```
OBJ $800
```

```
0222 C91B CMP #$1B ;SHORTHAND COMMAND?
0224 D049 BNE RTN ;NO, RETURN
0226 200300 JSR $0003 ;PRINT WHITE SQUARE
0229 200CFD GET JSR $FD00 ;GET COMMAND KEY
022C A243 LEX #$43 ;# OF BYTES IN TABLE-1
022E DD8002 LOOK CMP TABL,X ;LOOK FOR A MATCH
0231 F005 BEQ GOT ;FOUND IT?
0233 CA DEX ;NEXT BYTE IN TABLE
0234 10F8 BPL LOOK ;TRY AGAIN
0236 30F1 BMI GET ;NO MATCH--GET ANOTHER KEY
0238 ACFF GOT LDY $FFF ;SEARCH COMMAND TABLE
023A 8691 STX $91 ;SAVE KEY INDEX
023C E8 INX
023D CA G1 DEX ;NEXT COMMAND
023E F008 BEQ GETX ;FOUND COMMAND?
0240 C8 G2 INY ;NEXT CHAR. OF COMMAND
0241 B984A0 LDA $A084,Y ;GET CHAR.
0244 10FA BPL G2 ;NOT END OF COMMAND?
0246 30F5 BMI G1 ;END OF COMMAND
0248 68 GETX PLA ;PULL Y REG.
0249 B592 STA $92 ;SAVE IT IN $92
024B 68 PLA ;PULL X REG.
024C AA TAX
024D C8 OUT INY ;PRINT THE COMMAND
024E B984A0 LEA $A084,Y ;GET CHAR.
0251 3005 BMT HYBIT ;END OF COMMAND?
0253 207202 JSR PRIN ;PRINT CHAR.
0256 D0F5 BNE OUT ;BRANCH ALWAYS
0258 297F HYBIT AND #$7F ;ZERO MSB
025A 207202 JSR PRIN ;PRINT LAST CHAR.
025D A92C LEA $92C ;ADD "(" ?
025F C591 CMP $91
0261 1005 BPL DONE ;NO, EXIT
0263 A928 LDA $928 ;PRINT "("
0265 207202 JSR PRIN
0268 8A DONE TYA ;RESTORE X AND Y REG.
0269 48 PHA
026A A592 LDA $92
026C 48 PHA
026D A901 LDA $901
026F 4C121E RTN JMP PATCH+3 ;EXIT ROUTINE
0272 E047 PRIN CPX #$47 ;INPUT BUFFER FULL?
0274 B004 BCS PO+1 ;YES, PRINT BEL CHAR.
0276 9513 STA $13,X ;STORE IN BUFFER
0278 E8 INX
0279 2CA907 PO BIT $07A9 ;LOAD BEL CHAR.
027C 6C1A02 JMP ($021A) ;PRINT CHAR. & RETURN
```

```
02D7 D00D BNE CONT ;NO, TO REG. OUTPUT
02D9 C614 DEC $14 ;DECREMENT COUNTER
02DB D009 BNE CONT ;IS COUNTER ZERO?
02DD 200CFD JSR $FD00 ;GET CHAR. FROM KYBD.
02E0 C920 CMP #$20 ;IS IT A SPACE?
02E2 D005 BNE STOP ;IF NOT, STOP
02E4 C613 31 DEC $13 ;TURN OFF FLAG
02E6 4CAB1F 32 CONT JMP RTN ;TO REGULAR OUTPUT
02E9 4CE1F 33 STOP JMP XIT ;TO IMMEDIATE MODE
```

MICRO

# Now You Have "The Choice"

*Reliability, Quality and Performance at a reasonable Price. Systems International, Inc. is pleased to offer an alternate to Ohio Scientific microcomputers. Our systems are 100% compatible to OSI OS-65D and OS-65U software to preserve your software development investment. Just load your present floppies and run; no conversion of software needed or required. Compare the Following Facts and Make "The Choice."*

## **Ohio Scientific, Incorporated Standard Features C2-OEM**

48K Memory, 1 MHz  
One Serial Port  
Dual 8" Single Sided Floppies  
Plug in Boards with Many Connections  
120 Volt 60, Hz Operation Only  
90-Day Warranty  
Weight 80 Pounds  
Size W17" x H9½" x D23½"

### **Extra Cost Items**

Second Serial Port  
Parallel Port  
2 MHz

## **Systems International, Incorporated Standard Features The Choice II**

48K Memory, 2 MHz  
2 Serial Ports, 1 Parallel Port  
Dual 8" Double Sided Floppies  
Single Board Construction for Reliability  
120/240 Volt 50/60 Hz Operation  
180-Day Warranty  
Weight 40 Pounds  
Size W12½" x H13½" x D16"  
Shippable by UPS in Factory Carton

### **Extra Cost Items**

None

# Now Compare the Bottom Line and Make "The Choice"

**Total Retail \$4,925.00 \***

**Total Retail \$4,525.00**  
**240 Volt 50 Hz Operation add \$50.00**

Future plans include the "Choice III" which is 100% compatible to the OSI C2-D 8" Winchester System. Also Multi-user Winchester Hard Disk System that is 100% compatible with Ohio Scientific OS-65U Level 3 Software.

**REMEMBER — THERE IS "THE CHOICE" TO CHOOSE A BETTER SYSTEM!**

Domestic and International Dealer and Distributor Inquiries are Invited. Discounts to 40%

\* Ohio Scientific Price List June/July 1981

*Systems International Incorporated*

15920 Luanne Drive  
Gaithersburg, Maryland 20760

U.S.A.

Tel. (301) 977-0100 Twx# 710-828-9703



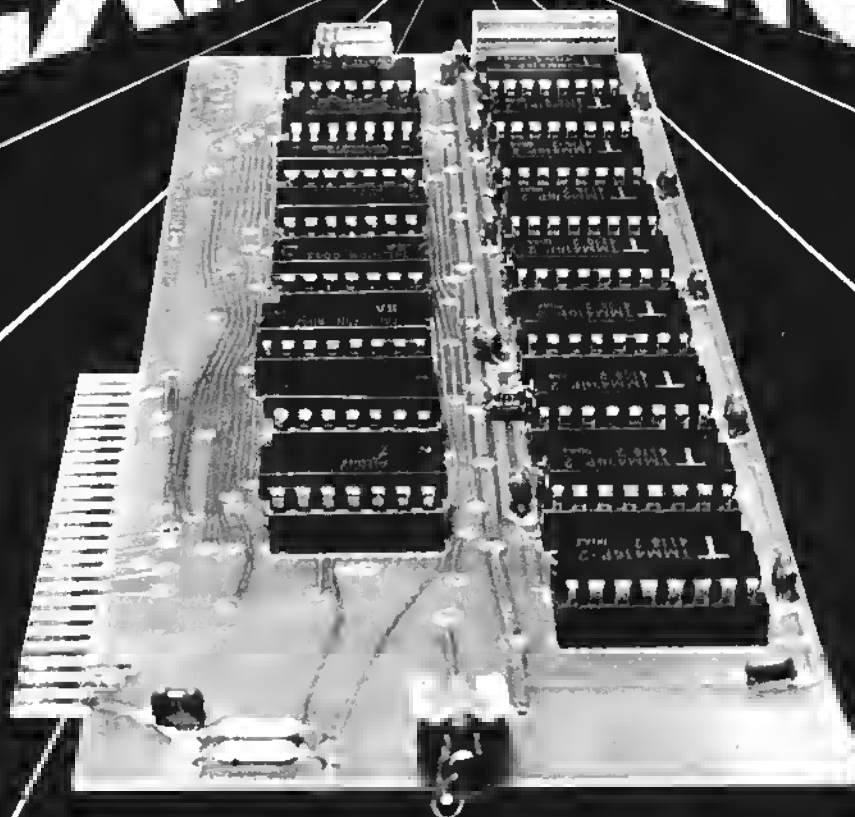
500 Chesham House  
150 Regent Street

London W1B 5LE, England

Tel. 01-439-6288 Tlx 261426

**NEW LOW PRICE  
DIRECT FROM MANUFACTURER  
\$120.00**

# EXPAND ✱ ENHANCE



## **16K RAM EXPANSION BOARD FOR THE APPLE II\* \$120.00**

The Andromeda 16K RAM Expansion Board allows your Apple to use RAM memory in place of the BASIC Language ROMs giving you up to 64K of programmable memory. Separate Applesoft\* or Integer BASIC ROM cards are no longer needed. The 16K RAM Expansion Board works with the Microsoft Z-80 card, Visicalc, DOS 3.3, Pascal, Fortran, Pilot, and other software. A switch on the card selects either the RAM language or the mainboard ROMs when you reset your Apple.

The Andromeda 16K RAM Expansion Board has a proven record for reliability with thousands of satisfied customers.

**Now with One Year Warranty.**

# ANDROMEDA



**INCORPORATED**  
Greensboro, NC. 27410  
P.O. Box 19144

919 852-1482



Price for Andromeda 16K RAM expansion board now only \$120.00. Please add \$5 for shipping and handling. North Carolina residents add 4% sales tax.

\*DEALER INQUIRIES WELCOME.

# Applesoft Variable Lister

**The ability to dump the values of all variables can be immensely helpful in Applesoft program development. The Applesoft Variable Lister provides this ability and can be used with any program, located anywhere in memory.**

Richard Albright  
Sienna Software  
25 Marion Road  
Watertown, Massachusetts 02172

Scott Schram, in his "Applesoft Variable Dump" article (MICRO 36:23), presented a machine language program for printing the current values of all Applesoft variables in use. Such a program is immensely useful in developing and debugging Applesoft programs because it permits the programmer to easily display the values of all simple variables at any time. Also, by providing a list of used variable names, it helps prevent the accidental duplication of names, which is an easy mistake to make with Applesoft's two-character names.

I used Schram's routine successfully on a number of Applesoft programs, but I also discovered a number of programs on which the routine did not work at all or did not work well. The primary problem lies in its need to be loaded at \$4000. This location is the start of Applesoft's Hi-Res page two. Therefore any program using Hi-Res page two cannot use Schram's routine. Moreover, any program loaded above Hi-Res page one (virtually a requirement for any large program using Hi-Res graphics) will probably spill over the \$4000 boundary.

I also attempted to use this routine on a program having nearly 100 simple variables and discovered how difficult it is to find the value of a single variable in an unsorted list of that length. The inability to list the names of array variables was also troublesome at times.

After trying to modify Schram's routine, I decided that a different approach was needed. My approach involves three routines — an Applesoft subroutine and two machine language routines. I will refer to these three routines collectively as the "Applesoft Variable Lister" (or simply "Lister").

## Installing the Lister

The Applesoft Variable Lister may be attached to any Applesoft program by simply merging its Applesoft subroutine with the main program. This can be accomplished using the standard Apple RENUMBER program or the like. Any unused space in which the 71 lines will fit without affecting the normal operation of the program will do, but the end of the program is the recommended location.

Once installed within the program, the Lister can be invoked like any Applesoft subroutine; that is, by means of a GOSUB n statement where n is the number of the first line of the subroutine within the program. This GOSUB can be issued by the main program or from the keyboard.

The Lister will operate under both ROM and RAM Applesoft, but requires the use of a disk drive. The disk drive last accessed before the Lister was invoked must contain a diskette on which the Lister's two machine language routines are stored under the names SHELL-METZNER SORT and APPLESOFT VARIABLE LISTER OBJ. In addition, one file buffer must be available.

## Using the Lister

The output from the Lister will appear on both a printer and the screen if the printer is open at the time the Lister is invoked. Otherwise, the output goes to the screen only. The output format for the printer is slightly different from the screen format.

Figure 1 is an example of the printed output format. User responses to prompts have been underlined. When the Lister is invoked, it first queries you for

ALPHA SORT, MEMORY SORT  
OR QUIT?

with the double-underlined letters appearing in inverse on the screen. A 'Q' response at this point simply terminates the Lister with no further ado. An 'A' response results in an alphabetical listing of variables while an 'M' response will cause variables to be listed in the order stored. After either an 'A' or an 'M' response, the disk drive will activate briefly while a temporary file is created (more on this later).

Next, the Lister asks if you would like to display

VALUES OR LOCATIONS?

A 'V' response will give you the current value for each simple variable (as shown in figure 1); an 'L' response produces a display of locations at which the values are stored in memory.

At this point the disk drive will again activate while the APPLESOFT VARIABLE LISTER OBJ and (if ALPHA SORT has been selected) the SHELL-METZNER SORT files are read and another temporary file is created. If sorting is performed, a

SORTING VARIABLE NAMES . . .

# MICRObits

## MICRObits

MICRObits (formerly known as MICRO classified) is increasing to \$25.00 per insertion, prepaid, beginning with the January '82 issue. However, MICRO subscribers can advertise in MICRObits, one time, at the old rate of \$10.00. (One \$10.00 ad per subscriber, subsequent ads \$25.00.) To submit an ad to MICRObits, send typewritten copy to reach MICRO by the 20th of the second month before the issue you would like the ad to appear in (i.e., by January 20th for the March issue). 40-word text limit. Late ads held for next issue. Send to:

MICRObits  
P.O. Box 6502  
Chelmsford, MA 01824

### Ohio Scientific C1P, C4P COLOR

Earthship has GREAT programs. C1P, C4P — Animated Lunar Lander, Catchword, real-time Scrabble, graphics designer, analytical plotter, single disk copier; CIP — animation and shape table graphics, BASIC tutor, add and multiply tutor, information processing simulation and tutor. Send for catalog.

Earthship  
17 Church Street #28  
Nutley, New Jersey 07110

### Spanish Hangman

2,000 SPANISH words and sentences taught in a fun way on the Apple. Send for your school's free 30-day evaluation diskette, from:

George Earl  
1302 South General McMullen  
San Antonio, TX 78237

### Business Software by ADS

For the Apple II and Atari/800. Why pay more for a bunch of unrelated programs? Business Plus will handle invoices, statements, credit memos and more, much more! Just \$299 complete or \$25 for demo disk (credited towards purchase). VISA, Mastercharge accepted.

Advanced Data Systems  
7468 Maple Avenue  
St. Louis, MO 63143  
314/781-9388

(Continued on page 90)

Figure 1: Example of Printed Output

APPLESOFT VARIABLE LISTER  
ALPHA SORT, MEMORY SORT OR QUIT? A  
VALUES OR LOCATIONS? V  
SORTING VARIABLE NAMES...

Simple Variables; Alpha Order			
Var	Value	Var	Value
A	0	LB\$	
A \$		ML%	3
B1\$	3 LETTERS	MQ	99
B2\$	0	MR	99
BS\$		NL%	12
CAS		NQ%	9
CL\$	CLOSE	NR	12
CR\$			
		NR%	0
D	0	NS%	10
D \$		O0\$	OPEN SURVEY C
EQ	1	O1\$	OPEN SURVEY T
ER%	1	O2\$	OPEN INTERVIEW
F1\$	TEST1	OP\$	OPEN SURVEY T
FQ%	9	PP	0
I	96	Q	1
J	0	QQ	1
K	0	R	0
L	0	R0\$	READ SURVEY C
L1	9	R1\$	READ SURVEY T
L2	1	RE\$	READ SURVEY C
RR	1		
RT%	4		
SS	0		
T \$			
UN	2048		
V	5		
W2\$	WRITE INTERVI		
XR%	1		
ZZ	1		

Array Variables; Alpha Order			
Var	Hex	Dec	Var
CT	\$2DB2	11698	
DT\$	\$33F5	13301	
QC	\$2F99	12185	
R \$	\$3194	12692	

message is displayed while the names are being sorted. Usually the sorting process takes only a few seconds.

After a slight pause, the first page of variables will be displayed (and printed if the printer is on). A two-column format is used for all combinations of display options. Numeric values are displayed to full precision, but strings longer than 14 characters are truncated. Forty variables appear on a full page. The message

HIT SPACE BAR TO CONTINUE;  
'ESC' TO QUIT

appears on the screen (not on the printer) after each page. Pressing the ESC key results in the termination of the Lister (after some more disk activity). Pressing the space bar, on the other hand, causes the next page of simple variables to be displayed. If all simple variables have been displayed, the first page of array variables is produced. Notice that array variable values *cannot* be displayed; only the location of the start of each array is provided — even if VALUES is the selected display mode.

Following the last array page, the Lister is terminated by pressing either the space bar or the ESC key. At this



point the disk drive will again briefly activate. If the Lister was invoked from the keyboard, a

## RETURN WITHOUT GOSUB

error message will be encountered and can be ignored. If invoked from the main program, execution continues normally with the statement following the GOSUB.

## The Source Code

The Applesoft Variable Lister consists of an Applesoft subroutine (listing 1), a machine language setup routine (listing 2), and a machine language sort routine (listing 3). The Applesoft subroutine can be entered and SAVED under an arbitrary name. The machine language routines may be entered into

memory either directly using the monitor or indirectly using an assembler, then BSAVED under the names APPLESOFT VARIABLE LISTER OBJ (for the setup routine) and SHELL-METZNER SORT (for the sort routine).

## Technical Notes

The Lister's Applesoft subroutine occupies about 3500 bytes of memory. In addition, execution of the Lister requires a certain amount of free space: five bytes per variable if the ALPHA SORT option is chosen and ten bytes per variable if the MEMORY SORT option is selected. The Lister does not verify that this space is available. If insufficient space exists, the result is unpredictable.

If the addition of the Lister to a program using Hi-Res graphics causes the

program to overflow into the Hi-Res memory area, then the merged program should be saved and reloaded above the Hi-Res memory. If only Hi-Res page one is used, this move is accomplished by executing the following POKES between the SAVE and the LOAD:

POKE 103,1:POKE 104,64:POKE 16384,0

To move the program above Hi-Res page two, use the following POKES:

POKE 103,1:POKE 104,96:POKE 24576,0

The Lister's Applesoft subroutine itself uses three simple variables (ZZ, ZZ% and ZZ\$) and one array variable (ZZ). These variable names should be

## Listing 1: Applesoft Variable Lister

```
10 FOR ZZ = 32 TO 35: POKE 715 + ZZ, PEEK (ZZ): NEXT ZZ
20 POKE 32,0: POKE 33,40: POKE 34,0: POKE 35,24: TEXT : NORMAL
30 PRINT : INVERSE : PRINT SPC( 7);"APPLESOFT VARIABLE LISTER": SPC( 8)
   : NORMAL
40 FOR ZZ = 0 TO 9: POKE 752 + ZZ,48 + ZZ: NEXT ZZ: FOR ZZ = 10 TO 15: POKE
   752 + ZZ,55 + ZZ: NEXT ZZ
50 PRINT : INVERSE : PRINT "A":; NORMAL : PRINT "LPHA SORT. ":; INVERSE
   : PRINT "M":; NORMAL : PRINT "EMORY SORT OR ":; INVERSE : PRINT "Q":
   : NORMAL : PRINT "UIT? "
60 ZZ = PEEK ( - 16384): IF ZZ < 128 THEN 60
70 POKE - 16368,0: PRINT CHR$( ZZ): IF ZZ < > 193 AND ZZ < > 205 AND
   ZZ < > 209 THEN PRINT CHR$( 7): GOTO 50
80 IF ZZ = 209 THEN 700
90 ZZ = ZZ - 192: IF ZZ > 1 THEN ZZ = 2
100 POKE 250,ZZ: INVERSE : PRINT "V":; NORMAL : PRINT "ALUES OR ":; INVERSE
   : PRINT "L":; NORMAL : PRINT "OCATIONS? "
110 ZZ = PEEK ( - 16384): IF ZZ < 128 THEN 110
120 POKE - 16368,0: PRINT CHR$( ZZ): IF ZZ < > 204 AND ZZ < > 214 THEN
   PRINT CHR$( 7): GOTO 120
130 ZZ = ZZ - 204: IF ZZ > 0 THEN ZZ = 2
140 ZZ = ZZ + PEEK (250)
150 PRINT CHR$( 4);"BSAVE PAGE 3 SAVE,A$300,L$100": PRINT CHR$( 4);"BS
   AVE PAGE 0 SAVE,A$0,L$40"
160 PRINT CHR$( 4);"BLOAD APPLESOFT VARIABLE LISTER OBJ": PRINT CHR$( 4)
170 POKE 250,ZZ:ZZ = FRE (0): CALL 768
180 POKE 251, PEEK (111): POKE 252, PEEK (112): IF PEEK (250) = 2 OR PEEK
   (250) = 4 THEN 260
190 PRINT CHR$( 4);"BSAVE PAGE 0 SAVE2,A$0,L$40": PRINT CHR$( 4)
200 PRINT CHR$( 4);"BLOAD SHELL-METZNER SORT": PRINT CHR$( 4)
210 PRINT : PRINT "SORTING VARIABLE NAMES . . .": PRINT
220 POKE 25,5: POKE 26,0: POKE 27,3
230 ZZ = PEEK (251) + 256 * PEEK (252) + 5 * PEEK (254): POKE 28, PEEK
   (253): POKE 29,0: POKE 31, INT (ZZ / 256): POKE 30,ZZ - 256 * PEEK
   (31):ZZ = PEEK (254): CALL 768
240 POKE 28,ZZ: POKE 29,0:ZZ = PEEK (30) + 256 * PEEK (31) - 5 * ZZ: POKE
   31, INT (ZZ / 256): POKE 30,ZZ - 256 * PEEK (31): CALL 768
250 PRINT CHR$( 4);"BLOAD PAGE 0 SAVE2": PRINT CHR$( 4);"DELETE PAGE 0
   SAVE2": PRINT CHR$( 4)
260 HOME : INVERSE : PRINT SPC( 5);"SIMPLE VARIABLES. ":; IF PEEK (250)
   = 1 OR PEEK (250) = 3 THEN PRINT "ALPHA ORDER": SPC( 6):
270 IF PEEK (250) = 2 OR PEEK (250) = 4 THEN PRINT "MEMORY ORDER": SPC(
   5);
280 PRINT : NORMAL : IF PEEK (253) = 0 THEN PRINT : PRINT "NO SIMPLE V
   ARIABLES": GOSUB 400: GOTO 320
290 ZZ(0) = PEEK (253):ZZ(1) = PEEK (251) + 256 * PEEK (252) + 5 * ( PEEK
   (253) + PEEK (254))
300 IF PEEK (250) > 2 THEN ZZ = ZZ: POKE 25, PEEK (131): POKE 26, PEEK
   (132):ZZ$ = ZZ$: POKE 27, PEEK (131): POKE 28, PEEK (132):ZZ% = ZZ%:
   POKE 29, PEEK (131): POKE 30, PEEK (132)
310 GOSUB 450
320 IF PEEK (250) > 2 THEN POKE 250, PEEK (250) - 2
330 HOME : INVERSE : PRINT SPC( 6);"ARRAY VARIABLES. ":; IF PEEK (250)
   = 1 THEN PRINT "ALPHA ORDER": SPC( 6):
340 IF PEEK (250) = 2 THEN PRINT "MEMORY ORDER": SPC( 5);
```

```

350 PRINT : NORMAL : IF PEEK (254) = 0 THEN PRINT : PRINT "NO ARRAY VA
RIABLES": GOSUB 400: GOTO 370
360 ZZ(0) = PEEK (254):ZZ(1) = PEEK (251) + 256 * PEEK (252) + 5 * PEEK
(254): GOSUB 450
370 GOTO 660
380 VTAB 2: PRINT "VAR HEX DEC * VAR HEX DEC": PRINT "----"
-----
* -----": RETURN
390 VTAB 2: PRINT "VAR VALUE * VAR VALUE": PRINT "----"
-----
* -----": RETURN
400 ZZ$ = "HIT" + CHR$(96) + "SPACE" + CHR$(96) + "BAR" + CHR$(96) +
"TO" + CHR$(96) + "CONTINUE" + CHR$(123) + CHR$(96) + CHR$(1
03) + "ESC" + CHR$(103) + CHR$(96) + "TO" + CHR$(96) + "QUIT"
410 FOR ZZ = 1 TO LEN (ZZ$): POKE ZZ + 1999, ASC ( MID$ (ZZ$,ZZ,1)) - 6
4: NEXT ZZ
420 ZZ = PEEK ( - 16384): IF ZZ < 128 THEN 420
430 POKE - 16384,0: IF ZZ < > 155 THEN PRINT : PRINT : RETURN
440 POP : POP : GOTO 660
450 REM PRINT VARIABLE NAMES & LOCATIONS
460 ZZ(10) = INT (( PEEK (250) + 1) / 2): ON ZZ(10) GOSUB 380,390: POKE
34,3
470 ZZ(3) = C:ZZ(1) = ZZ(1) - 5
480 ZZ(2) = ZZ(3) + 1: IF ZZ(2) > ZZ(0) THEN POKE 34,0: RETURN
490 ZZ(3) = ZZ(2) + 19: IF ZZ(3) > ZZ(0) THEN ZZ(3) = ZZ(0)
500 ZZ(6) = ZZ(2) - 1
510 ZZ(6) = ZZ(6) + 1: IF ZZ(6) > ZZ(3) THEN ZZ(1) = ZZ(1) - 100:ZZ(3) =
ZZ(3) + 20: GOSUB 400: HOME : GOTO 480
520 VTAB ZZ(6) - ZZ(2) + 4:ZZ(8) = ZZ(1): GOSUB 540: PRINT SPC( 19 - POS
(0));"* " : IF ZZ(6) + 20 < = ZZ(0) THEN ZZ(8) = ZZ(1) - 100: GOSUB
540
530 PRINT :ZZ(1) = ZZ(1) - 5: GOTO 510
540 PRINT CHR$( PEEK (ZZ(8))) : CHR$( PEEK (ZZ(8) + 1)) : CHR$( PEEK (
ZZ(8) + 2)) : " " : IF ZZ(10) = 2 THEN 600
550 PRINT "$":ZZ(5) = PEEK (ZZ(8) + 4):ZZ(4) = PEEK (ZZ(8) + 3):ZZ(7)
= INT (ZZ(5) / 16): PRINT CHR$( PEEK (752 + ZZ(7))) : CHR$( PEEK
(752 + ZZ(5) - 16 * ZZ(7))) :
560 ZZ(7) = INT (ZZ(4) / 16): PRINT CHR$( PEEK (752 + ZZ(7))) : CHR$( PEEK
(752 + ZZ(4) - 16 * ZZ(7))) :
570 ZZ$ = STR$( 256 * ZZ(5) + ZZ(4))
580 PRINT SPC( 6 - LEN (ZZ$)):ZZ$:
590 RETURN
600 ZZ(9) = PEEK (ZZ(8) + 3) + 256 * PEEK (ZZ(8) + 4):ZZ = PEEK (ZZ(8)
+ 2) - 31: IF ZZ > 1 THEN ZZ = ZZ - 3
610 ON ZZ GOTO 620,640,650
620 ZZ(7) = PEEK (25) + 256 * PEEK (26) - 2: POKE ZZ(7) + 2, PEEK (ZZ(9)
+ 2): POKE ZZ(7) + 3, PEEK (ZZ(9) + 3): POKE ZZ(7) + 4, PEEK (ZZ(9)
+ 4): POKE ZZ(7) + 5, PEEK (ZZ(9) + 5)
630 POKE ZZ(7) + 6, PEEK (ZZ(9) + 6): PRINT ZZ: RETURN
640 ZZ(7) = PEEK (27) + 256 * PEEK (28) - 2: FOR ZZ = 2 TO 4: POKE ZZ(7)
+ ZZ, PEEK (ZZ(9) + ZZ): NEXT ZZ: PRINT LEFT$( ZZ$,14): RETURN
650 ZZ(7) = PEEK (29) + 256 * PEEK (30) - 2: FOR ZZ = 2 TO 3: POKE ZZ(7)
+ ZZ, PEEK (ZZ(9) + ZZ): NEXT ZZ: PRINT ZZ$: RETURN
660 IF ZZ = 209 THEN 700
670 HOME : PRINT : PRINT CHR$( 4):"BLOAD PAGE 0 SAVE": PRINT CHR$( 4):
"DELETE PAGE 0 SAVE": PRINT CHR$( 4)
680 PRINT CHR$( 4):"BLOAD PAGE 3 SAVE"
690 PRINT CHR$( 4):"DELETE PAGE 3 SAVE": PRINT CHR$( 4)
700 FOR ZZ = 32 TO 35: POKE ZZ, PEEK (715 + ZZ): NEXT ZZ
710 HOME : RETURN

```

avoided in the main program: if they appear in the main program, execution of the Lister subroutine will reset their values.

Both the SHELL-METZNER SORT and APPLESOFT VARIABLE LISTER OBJ routines use page three of memory. However, the contents of page three at the time the Lister is invoked are saved on diskette in a temporary file named PAGE 3 SAVE. The original page three is restored as part of the Lister termination processing.

Both machine language routines make extensive use of page zero, but, again, a temporary file (PAGE 0 SAVE) is used to save the initial values and they are restored when the Lister finishes. However, only part of page zero is restored, leaving some page zero values

altered after running the Lister. Specifically, locations 24 to 31 (\$18 to \$1F) are altered. These locations are not normally used by an Applesoft program.

A third temporary file (PAGE 0 SAVE2) is used if ALPHA SORT is selected. It is used to restore page zero values after the sorting has been completed. All temporary files are deleted by the Lister if it terminates normally. Both the SHELL-METZNER SORT and the APPLESOFT VARIABLE LISTER OBJ routines are fully relocatable.

The sorting routine uses the Shell-Metzner algorithm and is designed to sort fixed-length records so that the one with the lowest key value appears highest in the memory. Up to 32,767 records occupying contiguous locations may be sorted with this routine, space permit-

ing. Each record may be up to 255 bytes in length and must have a sort key field that may be as short as one byte or as long as the entire record. The key is evaluated as an unsigned binary integer field and the sorting is performed on that basis.

The sort routine uses memory locations 25 to 31 (\$19 to \$1F) as an input argument list, interpreted as follows:

25	(\$19):	record length
26	(\$1A):	key offset (i.e., record characters preceding the key)
27	(\$1B):	key length
28-29	(\$1C-\$1D):	number of records
30-31	(\$1E-\$1F):	pointer to 1st byte of 1st record.

The last two items are two-byte binary integers, presented in the usual low

## Listing 2: The APPLESOFT VARIABLE LISTER OBJ Routine

```

*****
*
*   APPLESOFT VARIABLE LISTER OBJ
*   =====
*
*   SEPTEMBER 30, 1981
*
*   THIS ROUTINE CREATES AN N-BY-5 ARRAY
*   OF APPLESOFT VARIABLE INFORMATION AT
*   THE BOTTOM OF THE STRING STORAGE AREA.
*   EACH 5-BYTE 'RECORD' CONTAINS A
*   3-BYTE NAME AND A 2-BYTE POINTER TO
*   ITS LOCATION IN MEMORY.
*
*****
*
VNAME EQU $A5      ;CURRENT VARIABLE NAME
VLOC  EQU $A8      ;CURRENT VARIABLE LOCATION
VTYPE EQU $AA      ;VARIABLE TYPE(0=SIMPLE;1=ARRAY)
NSIMPL EQU $FD     ;COUNT OF SIMPLE VARIABLES
NARRAY EQU $FE     ;COUNT OF ARRAY VARIABLES
*

0300:          ORG $300
0300:          *
0300:A5 69      LDA $69      ;INITIALIZE VARIABLE POINTER TO
0302:85 A8      STA VLOC     ;START OF SIMPLE VARIABLE
0304:A5 6A      LDA $6A      ;SPACE
0306:85 A9      STA VLOC+1
0308:A9 00      LDA #$00     ;INITIALIZE VARIABLE COUNTERS
030A:85 FD      STA NSIMPL   ;TO ZERO
030C:85 FE      STA NARRAY
030E:85 AA      STA VTYPE    ;START WITH SIMPLE VARIABLES
0310:A5 AA      TOP LDA VTYPE ;TOP OF MAIN LOOP
0312:18        CLC
0313:65 AA      ADC VTYPE    ;SET X TO 2 TIMES THE
0315:AA        TAX          ;VARIABLE INDEX
0316:A5 A9      LDA VLOC+1   ;IF CURRENT VARIABLE IS NOT
0318:D5 6C      CMP $6C,X    ;BEYOND THE END OF THE
031A:90 11      BCC STRTVP   ;STORAGE SPACE FOR THE
031C:D0 06      BNE INCVT    ;CURRENT VARIABLE TYPE,
031E:A5 A8      LDA VLOC     ;THEN GO ON TO VARIABLE
0320:D5 6B      CMP $6B,X    ;PROCESSING
0322:90 09      BCC STRTVP
0324:E6 AA      INCVT INC VTYPE ;INCREMENT VARIABLE TYPE
0326:A4 AA      LDY VTYPE
0328:C0 02      CPY #$02
032A:D0 E4      BNE TOP      ;GO BACK TO THE TOP IF INDEX<>2
032C:60        RTS          ;QUIT IF INDEX=2
032D:A6 AA      STRTVP LDX VTYPE ;START OF VARIABLE PROCESSING
032F:F6 FD      INC NSIMPL,X  ;INCREMENT VARIABLE COUNT
0331:A2 00      LDX #$00     ;BLANK OUT CURRENT VARIABLE
0333:A9 20      LDA #$20     ;NAME
0335:95 A5      BLNKVN STA VNAME,X
0337:E8        INX
0338:E0 03      CPX #$03
033A:D0 F9      BNE BLNKVN
033C:A0 00      LDY #$00     ;IF BIT 7 IS OFF, THEN
033E:B1 A8      LDA (VLOC),Y ;SKIP INTEGER PROCESSING
0340:C9 7F      CMP #$7F
0342:90 18      BCC SAVE1
0344:A2 25      LDX #$25     ;ATTACH 'E' TO NAME
0346:86 A7      STX VNAME+2
0348:29 7F      AND #$7F     ;SAVE 1ST CHARACTER
034A:85 A5      STA VNAME
034C:C8        INY          ;STRIP BIT 7 FROM 2ND CHARACTER
034D:B1 A8      LDA (VLOC),Y ;AND SAVE IF NOT $00
034F:29 7F      AND #$7F
0351:C9 00      CMP #$00
0353:F0 1C      BEQ LOWER
0355:85 A6      STA VNAME+1
0357:18        CLC          ;SKIP STRING PROCESSING
0358:90 17      BCC LOWER
035A:90 B4      RELAY BCC TOP ;RELAY RETURN TO TOP
035C:85 A5      SAVE1 STA VNAME ;SAVE 1ST CHARACTER
035E:C8        INY          ;GET 2ND
035F:B1 A8      LDA (VLOC),Y
0361:C9 7F      CMP #$7F     ;IF BIT 7 IS OFF, THEN
0363:90 06      BCC SAVE2   ;SKIP STRING PROCESSING
0365:A2 24      LDX #$24     ;ATTACH 'S' TO NAME
0367:86 A7      STX VNAME+2
0369:29 7F      AND #$7F     ;STRIP BIT 7
036B:C9 00      SAVE2 CMP #$00 ;SAVE 2ND CHARACTER IF NOT ZERO

```

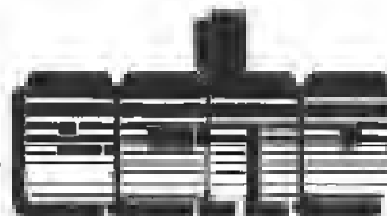
byte/high byte format. The sorting routine does not alter the values placed in any of these locations, nor does it verify their consistency.

Although the sort routine can handle thousands of records, the setup routine can handle a maximum of 255 variables of any types (simple or array). If more than 255 simple or array variables exist, the operation of the Lister is unpredictable.

Strings containing one or more carriage return characters (ASCII 13) cause formatting problems on both the screen and the printer. If the value appears in the left column on the screen, then one variable may be omitted from the right column. On the printer, one or more blank lines may be introduced. This problem is exemplified in figure 1: the CR\$ string consists of a single carriage return character, resulting in the unexpected gap between the CR\$ and D variables in the left column and the NR and NR% variables in the right column.

## Conclusion

In spite of its minor restrictions, I have found the Applesoft Variable Lister to be a valuable programming aid. If you have any comments or suggestions for improving the Lister, I would like to hear from you. Write me at the address given at the beginning of this article.



## THE ULTIMATE HI-RES SCREEN PRINT PROGRAM FOR THE EPSON MX-80 OR MX-100

- Totally menu-driven, leading the user through the selection process.
- Single keystroke menu selection.
- Stacking of several images for subsequent, UNATTENDED printing.
- Inverse and OVERLAYED printing.
- Picture pre-view (including inverse and overlayed).
- Load images from disk automatically.
- Centered output, user titles ... more.

The program requires a 48K Apple II, or Apple II plus with DOS 3.3, and an Epson MX-80 or an MX-100 (equipped with the Graftax option). ECHO may be used with the following parallel interface cards:  
1) Apple 2) Epson 3) Tymac or 4) CCS.

**Price: \$49.95**

Dealer inquiries invited.

(N.J. add 5% sales tax, Foreign add \$5.00 air mail)  
Send check or money order to:

# HeadWare

P.O. BOX 871, N. ARLINGTON, NJ 07032

\*Apple — Trademark of Apple Computer Inc.

## Used Computer Exchange

Save time, money and mistakes. List as Buyer/Seller — get pricing advice with names and phone numbers of those who meet your criteria on first call. Apples, PETs, Atari, OSI, printers, CRTs, etc. 600+ listed. Pay only for results. Call:

(703) 471-0305 or  
(800) 336-3393  
Used Computer Exchange  
11484 Washington Plaza West  
Reston, VA 22090

## OSI Superboard/CIP Expansion Board

Adds 8K 2114 RAM and 4 EPROM sockets (2716 or 2732). All link addressable anywhere in memory, all lines buffered, plugs into expansion socket. Bare PCB \$39.95. Built (no RAM) \$99.95. Payment: check or Mastercard. Includes airmail return.

Northern Micro  
29 Moorcroft Park  
New Mill  
Huddersfield, England

## OSI Toolkit EPROM

2716 EPROM. Address 9800-9FFF. Adds 16 BASIC functions: RENUMBER, HEX/DEC, DEC/HEX, CONVERSION, CONTROLLED LIST, VARIABLE LIST, TRACE, VIEW, SEARCH, etc. \$39.95. Also: Assembler (3 x 2716) \$49.95. Exmon EPROM \$19.95. Payment: check or Mastercard. Includes airmail return.

Northern Micro  
29 Moorcroft Park  
New Mill  
Huddersfield, England

## Printer Spooling for OSI

Output directed to device #1 is automatically spooled to disk tracks. Outspool to printer at your leisure. Outspool features multiple copies and auto-paging. 5 1/4" dual floppy systems only. Specify RAM size and 65D rev (3.2 or 3.3). \$20.

Peter Koski  
144-F Delaware Avenue  
Troy, New York 12180

```

036D:F0 02      BEQ  LOWER
036F:85 A6      STA  VNAME+1
0371:38          SEC              ;LOWER START OF STRING
0372:A5 6F      LDA  $6F          ;STORAGE AREA BY 5
0374:E9 05      SBC  #$05
0376:B5 6F      STA  $6F
0378:A5 70      LDA  $70
037A:E9 00      SBC  #$00
037C:85 70      STA  $70
037E:A0 00      LDY  #$00          ;MOVE VARIABLE DESCRIPTION
0380:B9 A5      LDA  VNAME,Y      ;TO STRING STORAGE
0383:91 6F      STA  ($6F),Y
0385:C8          INY
0386:C0 05      CPY  #$05
0388:D0 F6      BNE  MOVE
038A:A5 AA      LDA  VTYPE        ;IF CURRENT VARIABLE TYPE=1
038C:C9 01      CMP  #$01        ;{I.E., AN ARRAY VARIABLE},
038E:F0 10      BEQ  INCPTR      ;SKIP SIMPLE VARIABLE
0390:18          CLC              ;INCREMENT CURRENT VARIABLE
0391:A5 AB      LDA  VLOC        ;LOCATION BY 7 AND GO ON
0393:69 07      ADC  #$07        ;TO THE NEXT VARIABLE
0395:B5 A8      STA  VLOC
0397:A5 A9      LDA  VLOC+1
0399:69 00      ADC  #$00
039B:85 A9      STA  VLOC+1
039D:18          CLC
039E:90 11      BCC  GETNXT
03A0:A0 02      LDY  #$02        ;INCREMENT CURRENT VARIABLE
03A2:18          CLC              ;LOCATION BY THE LENGTH
03A3:A5 AB      LDA  VLOC        ;OF THE CURRENT ARRAY
03A5:71 A8      ADC  (VLOC),Y    ;AND GO ON TO THE
03A7:AA          TAX              ;NEXT ARRAY VARIABLE
03A8:A5 A9      LDA  VLOC+1
03AA:C8          INY
03AB:71 A8      ADC  (VLOC),Y
03AD:85 A9      STA  VLOC+1
03AF:86 A8      STX  VLOC
03B1:18          CLC              ;GO ON TO THE NEXT
03B2:90 A6      BCC  RELAY      ;VARIABLE

```

## Listing 3: The SHELL-METZNER SORT Routine

```

*****
*                               *
*      SHELL-METZNER SORT      *
*      *****                *
*                               *
*      OCTOBER 4, 1981         *
*                               *
*  THIS ROUTINE USES THE SHELL-METZNER *
*  SORTING ALGORITHM TO SORT 'N' RECORDS OF *
*  'RL' BYTES EACH SO THAT FOR ANY RECORD *
*  ALL RECORDS HAVING LOWER KEY VALUES *
*  APPEAR ABOVE IT IN MEMORY.  EACH RECORD *
*  MAY BE UP TO 255 BYTES IN LENGTH AND THE *
*  SINGLE KEY FIELD MAY BE AS SHORT AS ONE *
*  BYTE OR AS LONG AS THE ENTIRE RECORD. *
*  THE KEY FIELD IS TREATED AS A BINARY *
*  INTEGER.  ALL RECORDS MUST EXIST IN *
*  CONTIGUOUS MEMORY LOCATIONS. *
*****
*
RL      EQU  $19      ;RECORD LENGTH
KEYOFF  EQU  $1A      ;KEY OFFSET FROM START OF RECORD
KEYLEN  EQU  $1B      ;KEY LENGTH
N        EQU  $1C      ;NUMBER OF RECORDS IN $1C-$1D
ARRAY    EQU  $1E      ;POINTER TO ARRAY IN $1E-$1F
KEYEND   EQU  $C9      ;OFFSET OF LAST KEY BYTE
I        EQU  $CA      ;INDEX I IN $CA-$CB
L        EQU  $CC      ;INDEX L IN $CC-$CD
M        EQU  $CE      ;INDEX M IN $CE-$CF
K        EQU  $D6      ;INDEX K IN $D6-$D7
J        EQU  $EB      ;INDEX J IN $EB-$EC
CNT1     EQU  $FA      ;TEMPORARY COUNTERS IN $FA-$FF
CNT2     EQU  $FC
CNT3     EQU  $FE
*
0300:          ORG  $300
0300:          *
0300:18          CLC              ;ESTABLISH OFFSET OF LAST
0301:A5 1A      LDA  KEYOFF      ;KEY BYTE
0303:C5 1B      ADC  KEYLEN
0305:85 C9      STA  KEYEND

```

## MICRObits

### TRS-80 Color Computer Game

Play "Brickaway" on any configuration of the Color Computer. A high-speed arcade game in 6809 machine language with realistic sound and brilliant colors. Only \$7.00 postpaid. Requires joysticks, sold on cassette.

Britt Monk, CDP  
P.O. Box 802  
Elyria, Ohio 44036

### AIM 65 Assembler Listings

ASMXRF reformats listings from the AIM ROM assembler into full-sized assembler listings, complete with cross reference, just like in the AIM Monitor Listing manual. It requires a full-sized printer or TTY. Object cassette and manual for \$25.00 or send SASE for information.

Nchalem Bay Software  
25730 Bach Drive  
Rockaway, OR 97136

### Software for VIC-20

TYPING TUTOR, 4 programs of increasing difficulty — \$9.95.  
FLASH-TESTER & LOADER, 2 programs load and quiz — \$7.95.  
SHARK JAWS, arade game — \$8.95.  
VIC-DEFLECTION, 1 to 4 players — \$6.95. \$1.00 postage per order. CA add 6% tax.

Academy Software  
P.O. Box 9403-M  
San Rafael, CA 94912

### KIM-1/OSI C1P Hardware

General expansion board adds memory and ports. Construction manual — \$10.00. Real-time clock manual describes hardware/software for interfacing through expansion board — \$10.00. TimeStack operating system implements programmable controller using expansion board and real-time clock. Manual — \$10.00. \$1.00 for specifications/notes.

Hunter Technical Services  
P.O. Box 359  
Elm Grove, WI 53122

```

0307:A5 1C      LDA N          ;INITIALIZE M TO N
0309:05 CE      STA M
030B:A5 1D      LDA N+1
030D:05 CF      STA M+1
030F:18        LOOP1      CLC          ;TOP OF MAIN LOOP
0310:66 CF      ROR M+1      ;M := M/2
0312:66 CE      ROR M
0314:A5 CE      LDA M          ;STOP IF M=0
0316:D0 05      BNE MORE
0318:A5 CF      LDA M+1
031A:D0 01      BNE MORE
031C:00        RTS
031D:A2 00      MORE      LDX #000      ;K := N-M
031F:38        SEC
0320:A5 1C      LDA N
0322:E5 CE      SBC M
0324:05 D6      STA K
0326:A5 1D      LDA N+1
0328:E5 CF      SBC M+1
032A:05 D7      STA K+1
032C:A9 01      LDA #001      ;J := 1
032E:85 E8      STA J
0330:A9 00      LDA #000
0332:05 EC      STA J+1
0334:A5 E8      LOOP2      LDA J          ;I := J
0336:85 CA      STA I
0338:A5 EC      LDA J+1
033A:05 C8      STA I+1
033C:18        LOOP3      CLC          ;L := I+M
033D:A5 CA      LDA I
033F:65 CE      ADC M
0341:85 CC      STA L
0343:A5 CB      LDA I+1
0345:65 CF      ADC M+1
0347:85 CD      STA L+1
0349:A2 00      LDX #000      ;SET X REGISTER TO 0
034B:A4 19      GETLOC     LDY RL      ;SET Y REGISTER TO RECORD LENGTH
034D:38        SEC          ;INITIALIZE CNT2 TO I-1
034E:B5 CA      LDA I,X
0350:E0 01      SBC #001      ;IF X=0
0352:85 FA      STA CNT1      ;INITIALIZE CNT3 TO L-1
0354:95 FC      STA CNT2,X    ;IF X=2
0356:B5 CB      LDA I+1,X    ;AND STORE THE SAME
0358:E0 00      SBC #000      ;VALUE IN CNT1
035A:85 FB      STA CNT1+1
035C:95 FD      STA CNT2+1,X
035E:08        GETOFF     DEY          ;MULTIPLY BY RECORD LENGTH TO
035F:F0 15      BEQ GETABS     ;GET THE OFFSET OF THE
0361:18        CLC          ;(I-1)TH RECORD (IF X=0) OR THE
0362:A5 FA      LDA CNT1      ;(L-1)TH RECORD (IF X=2) FROM
0364:75 FC      ADC CNT2,X    ;THE START OF THE ARRAY
0366:95 FC      STA CNT2,X
0368:A5 FB      LDA CNT1+1
036A:75 FD      ADC CNT2+1,X
036C:95 FD      STA CNT2+1,X
036E:90 EE      BCC GETOFF
0370:D0 CA      RELAY3      BNE LOOP3      ;RELAY RETURNS
0372:90 C0      RELAY2      BCC LOOP2
0374:D0 99      RELAY1      BNE LOOP1
0376:18        GETABS     CLC          ;ADD LOCATION OF START
0377:A5 1E      LDA ARRAY      ;OF ARRAY TO GET ABSOLUTE
0379:75 FC      ADC CNT2,X    ;LOCATION OF (I-1)TH OR
037B:95 FC      STA CNT2,X    ;(L-1)TH RECORD
037D:A5 1F      LDA ARRAY+1
037F:75 FD      ADC CNT2+1,X
0381:95 FD      STA CNT2+1,X
0383:E8        INX          ;ADD 2 TO X REGISTER
0384:E8        INX
0385:E0 04      CPX #004      ;GO GET (L-1)TH RECORD
0387:D0 C2      BNE GETLDC     ;IF X=2
0389:A4 1A      LDY KEYOFF     ;SET Y REGISTER TO KEY OFFSET
038B:B1 FE      COMPAR      LDA {CNT2},Y ;COMPARE (I-1)TH AND
038D:D1 FE      CMP {CNT3},Y  ;{L-1}TH KEY VALUES;
038F:90 29      BCC SWITCH    ;SWITCH RECORDS IF THE
0391:D0 2F      BNE INCJ      ;{L-1}TH KEY IS > THE
0393:C8        INY          ;{I-1}TH KEY
0394:C4 C9      CPY KEYEND
0396:D0 F3      BNE COMPAR
0398:F0 28      BEQ INCJ
039A:A4 19      SWITCH     LDY RL
039C:88        SW1         DEY
039D:B1 FC      LDA {CNT2},Y
039F:AA        TAX
03A0:B1 FE      LDA {CNT3},Y
03A2:91 FC      STA {CNT2},Y
03A4:8A        TXA

```

(Continued)

(continued)





**SENSIBLE SOFTWARE, INC. IS PLEASED TO INTRODUCE...**  
**OUR 1981 COLLECTION OF SUPERIOR SOFTWARE FOR THE APPLE COMPUTER...**

**APPLESOFT-PLUS STRUCTURED BASIC (APLUS)**

**\$25.00**

32K +, Disk II, ROM/RAM Applesoft, Apple II/Apple II +

APLUS is a 4K machine language utility that adds the following structured programming commands to Applesoft basic: 1) WHEN...ELSE...FIN, 2) UNTIL, 3) WHILE, 4) UNLESS, 5) CASE, 6) SELECT (variable), and 7) (OTHERWISE). Multi-line IF...THEN statements are also supported. APLUS allows the use of "named" subroutines or "procedures". The programmer can now instruct a program to "DO CURVE-FIT" without worrying about the location of the subroutine. APLUS automatically indents "LIST"-ed programs to clarify the logic flow. The APLUS "&CONVERT" command replaces the above structured programming commands with "GOTO"s and "GOSUB"s to provide a standard Applesoft program as output. New programs can now be written using "GOTO"-less logic.

**APPLESOFT PROGRAM OPTIMIZER (AOPT)**

**\$20.00**

32 +, Disk II, ROM/RAM APPLESOFT, Apple II/Apple II +

AOPT is a 2.2K machine language utility that will substantially reduce the size of an Applesoft program without affecting the operation of the program. AOPT automatically: 1) Shortens variable names, 2) Removes remarks, 3) Removes unreferenced lines, 4) Appends short lines together, 5) Removes extra colons, and 6) Renumbers line numbers. AOPT will convert a verbose, well documented, development version of a program into a memory-efficient, more secure, production version of the same program. This is the ORIGINAL and the BEST optimizer on the software market today!

**DOS PLUS**

**\$25.00**

32 +, Disk II, DOS 3.3, Apple II/Apple II +

DOS PLUS is the software solution for living with both 13-sector (DOS 3.1, 3.2, and 3.2.1) and 16 sector (DOS 3.3) Apple diskettes. DOS PLUS adds 8 new commands to Apple DOS. Three of these are built-in and five are user definable. The built-in commands include: 1) "F" to "flip" between DOS 3.2 and 3.3 (The user need not re-boot and any program that resides in memory will not be affected by the flip. The DOS version can even be changed within a program!), 2) "S" status command informs you what DOS version is currently active, and 3) "B" BLOAD- analysis is also provided to inform the user of the starting address and length of the last accessed binary file. DOS PLUS also includes a DOS COMMAND CHANGER program to allow easy customization of Apple DOS commands to suit individual tastes.

**DISK ORGANIZER II**

**—NEW—**

**\$30.00**

48K, Disk II, Apple II/Apple II +

DO II is the fastest and friendliest utility available today for organizing files on an Apple II diskette. DO II provides the following functions: 1) TITLING in Normal, Inverse, Flashing, Lower case, and other characters normally not available, 2) CUSTOM REDORDERING of the directory, 3) ALPHABETIZING, 4) DYNAMIC DISPLAY of ALL filenames on a diskette (including deleted files), 5) RENAMING files with the same character options as TITLING, 6) UNOLETING, 7) DELETING, 8) PURGING deleted files, 9) LOCKING (all or some), 10) UNLOCKING (all or some), 11) USE of DOS sectors for increased data storage, and 12) a SIMULATED CATALOG to show the modified directory before it is written to the diskette. DO II is completely MENU DRIVEN and attains it's speed by altering a RAM version of the catalog. DO II uses a very powerful SMART KEY to automatically locate the next valid filename for any specified disk operation. Compatible with DOS 3.1, 3.2, 3.2.1, and 3.3 as well as MUSE DOS to allow manipulation of SUPER TEXT files! (Note: Updates available for \$5.00 and original diskette.)

**PASCAL LOWER CASE**

**—NEW—**

**\$25.00**

48K +, Disk II, Apple II/Apple II +, Language System

This is the most recent commercially available LOWER CASE MOD for Pascal for the Apple II. It is the only currently available modification that is compatible with both versions of Pascal (1.0 and 1.1). The Pascal version is automatically checked prior to updating system Apple. If you have any of the hardware lower case adapters you can now input the following characters directly from the keyboard: | ~ ^ < > \_ and \. This modification does NOT interfere with any of the 'Control' character functions implemented by the Pascal environment and will 'undo' any alterations made by other commercially released modifications.

**QUICKLOADER**

**\$25.00**

48K +, Disk II, Apple II/Apple II + . . . (2 Disks)

If you find yourself doing the same things over and over -- QL will help you do it faster! QL is a unique disk that lets you load DOS, a language card (optionally), and an application program of your choice extremely rapidly. QL boots as a 13 or 16 sector diskette and is easy to set up and use. To change the setup, you merely load your Apple RAM with the new data and use the "RECDNFIGURE" option of QL. The next time you boot your QL disk, it will quickly load your new setup (Language Card, DDS, Application program) into your Apple! QL can reduce the time to perform these functions by up to 80%! Now that you've read this, you say "But I can already do all of that!" DL doesn't do anything new -- it just does it MORE CONVENIENTLY and FASTER! Try it, you'll like it!

**DISK RECOVERY ("THE SCANNER")**

**\$30.00**

48K +, Disk II, Apple II/Apple II +

This program is long overdue. You need no longer be concerned with the problem of physically damaged disks. Just as "Apple Pascal" provides a "BAD BLOCK SCAN", DISK RECOVERY will do a complete scan of your Apple diskettes' recording surface. Damaged areas will be "marked" as used in the disk directory so that no attempts will be made to "WRITE" to a bad sector. The VTDC will be completely redone to reflect both the bad sectors and actual disk usage. A complete report is generated advising the user of all corrections. A resulting "DISK MAP" is presented for your review. The greatest advantage of this program over the other versions is that it can be used on either NEWLY INITIALIZED DISKS or disks that ALREADY CONTAIN PROGRAMS as well as the SPEED of analysis. THE SCANNER is fully compatible with both 13 and 16 sector diskettes. This is a must for all Disk II owners!

**ALSO AVAILABLE:**

**SUPER DISK COPY III** ..... **\$30.00**  
**MULTI-DISK CATALOG III** ..... **\$25.00**  
**THE NEW PROTECTOR** ..... **\$250.00**  
(Call or Write for Information)  
**LUNAR LANDER II** ..... **\$16.00**  
**MASTER MAZE** ..... **\$18.00**

**SENSIBLE SOFTWARE, INC.**

6619 PERHAM DRIVE / W. BLOOMFIELD, MICHIGAN 48033  
313-399-8877

VISA and MASTERCARD WELCOME

Michigan Residents add 4% Sales Tax

Please add \$1.00 postage & handling for each item ordered.

```

03A5:91 FE          STA (CNT3),Y
03A7:C0 00          CPY #S00
03A9:D0 F1          BNE SW1
03AB:38             SEC             ;1 := 1-M
03AC:A5 CA          LDA 1
03AE:E5 CE          SBC M
03B0:85 CA          STA I
03B2:A5 CB          LDA I+1
03B4:E5 CF          SBC M+1
03B6:85 CB          STA I+1
03B8:A5 CB          LDA I+1 ;BRANCH ON I<1
03BA:30 06          BMI INCJ
03BC:D0 B2          BNE RELAY3
03BE:A5 CA          LDA I
03C0:D0 AE          BNE RELAY3
03C2:E6 EB          INCJ INC J ;J := J+1
03C4:D0 02          BNE INCJ2
03C6:E6 EC          INC J+1
03C8:A5 EC          INCJ2 LDA J+1 ;BRANCH ON J>K
03CA:C5 D7          CMP K+1
03CC:90 A4          BCC RELAY2
03CE:A5 EB          LDA J
03D0:C5 D6          CMP K
03D2:90 9E          BCC RELAY2
03D4:18             CLC
03D5:F0 9B          BEQ RELAY2
03D7:D0 9B          BNE RELAY1

```

MICRO

## MICRObits (continued)

### PET/CBM Owners

Real world software at low cost.  
2114 RAM adapter and 4K Memory  
Expansion for "old" 8K PETs. Write  
for free catalog!

Optimized Data Systems  
Dept. M, Box 595  
Placentia, CA 92670

### PET Arcade Software

*Astroidz* and *Munchman* games for  
your 8K old-new ROMs. *Astroidz*  
are invading the galaxy. Four levels  
of play. *Munchman* is based on  
arcade game Pac-Man. ZIP and ZAP  
are out to get you. Fantastic  
graphics. \$9.95 each cassette.

ComputerMat  
Box 1664M  
Lake Havasu, AZ 86403

### PASCAL LEVEL 1

This Pascal system allows the  
development of BRUNable programs.  
The system supports IF-THEN-ELSE,  
REPEAT-UNTIL, FOR-TO/  
DOWNTWO-DO, WHILE-DO, CASE-  
OF-ELSE, FUNCTION,  
PROCEDURE, PEEK, POKE as well  
as disk I/O via DOS (specify 3.2 or  
3.3). Price \$35.00. Send SASE for  
more information.

On-Going Ideas  
RD #1, Box 810  
Starksboro, VT 05487

### Extended SYM-BASIC

Adds 30 commands, requires 16K,  
\$85 US/\$95 Can., object on  
cassette, manual, and source listing.  
SYM-FORTH 1.0: fig-FORTH for  
16K SYM-1. Editor, assembler,  
cassette interface \$135 US/\$155  
Can., object on cassette, manual and  
source listing.

Saturn Software Limited  
8246 116A St.  
Delta, B.C., V4C 5Y9  
Canada

## CBM/PET? SEE SKYLES ... CBM/PET?

PET? SEE SKYLES ... CBM/PET? SEE

**"They laughed when I sat down  
at my PET and immediately pro-  
grammed in machine language...  
just as easily as writing BASIC."**

With the new Mikro, brought to you from England by Skyles  
Electric works, always searching the world for new products for PET/CBM owners. A  
4K machine language assembler ROM that plugs into your main board. At just \$80.00 for  
the Mikro chip, it does all the machine language work for you; all you have to do is start  
laying down the code.

The Mikro retains all the great screen editing features of the PET...even all the Toolkit  
commands. (If you own a Toolkit, of course.) Sit down and write your own machine  
language subroutine. The program you write is the source code you can save. And the  
machine language monitor saves the object code. The perfect machine language answer  
for most PET owners and for most applications. (Not as professional as the Skyles Macro-  
TeA...not as expensive, either.)

A great learning experience for those new to machine language programming but who  
want to master it easily. Twelve-page manual included but we also recommend the book,  
"6502 Assembler Language Programming," by Lance A. Leventhal at \$17.00 direct  
from Skyles.

Skyles guarantees your satisfaction: if you are not absolutely happy with your new  
Mikro, return it to us within ten days for an immediate, full refund.

Skyles Mikro Machine language assembler ..... \$80.00  
"6502 Assembler Language Programming" by Leventhal ..... 17.00  
Shipping and Handling ..... (USA/Canada) \$2.50 (Europe/Asia) \$10.00  
California residents must add 6% sales tax, as required.



**Skyles Electric Works**  
231E South Whisman Road  
Mountain View, California 94041  
(415) 965-1735

Visa/Mastercard orders: call tollfree  
(800) 227-9998 (except California).  
California orders: please call (415)  
965-1735.

## ... CBM/PET? SEE SKYLES

SEE SKYLES ... CBM/PET? SEE SKYLES

MICRO



### 6502 COOKBOOK

For the machine language programmer who knows it is time to get serious! Here are search and sort routines, utilities, I/O & interrupt procedures, conversion routines, stack operations. Contains flow charts, source listings, explanations. Machine codes provided in both octal and hexadecimal. Tens of thousands of our programmer's cookbooks are in use.

Order publication: 6502 SOFTWARE COOKBOOK  
Price in United States: just \$12.95 + \$1.00 s/h by mail.

Please include remittance with order. Allow 3 - 4 weeks for delivery. MasterCard & VISA credit cards accepted. Our phone line for credit card orders is (203) 888-1946. Foreign price list available. Write for more information.

☐ Check here for descriptive literature & catalog.

Name: \_\_\_\_\_

Addr: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_

MC/VISA # \_\_\_\_\_ Bank: \_\_\_\_\_

Signature: \_\_\_\_\_

## SCELBI Publications

35 Old State Road, Oxford, CT 06483

## POWER TO YOUR AIM

*Treat your AIM to a quality power supply:*

1. Designed to Rockwell's specifications for the AIM-65 (5 volts at 2 amps, regulated; 24 volts, .5 amps avg., 2.5 amps peak, unregulated).
2. *Overvoltage protection* to protect the expensive circuits in your AIM (5 volt output).
3. Handsome all metal case (two tone blue).
4. Fuse (externally accessible), switch, pilot light, line cord, cable from power supply to AIM — all included.
5. Conservative thermal design for long life.

\$64.95 plus shipping (5 lbs.)

CA residents add 6 % sales tax.  
VISA/MC, cashier's or registered check.  
Personal check (allow 2 weeks to clear).

**CompuTech**

Box 20054

Riverside, CA 92516

There's no  
Dr. Jekyll  
in Apple II\*  
programming...

Programming 6502 Assembly Language is no longer frightening or a monster problem. Because Randy Hyde has written the book that's easy to understand, easy to follow. It turns assembly language into the 'friendly language'. For anyone. For the average Apple II owner and the newest beginner.

Let Mr. Hyde get you started immediately, with string and math operations. See how to convert BASIC programs so they run up to 100 times faster! Discover Sweet-16, the 'hidden' 16-bit pseudo computer inside your Apple. Enjoy using your Apple to the maximum by following the step-by-step, practical examples... which turn you into a programmer in the blink of a chapter.

thanks to Mr. Hyde

\$19.95 per easy-reading copy at computer stores everywhere, or from:

**DATAMOST**

19273 Kenya St.  
Northridge, CA 91326  
(213) 366-7160

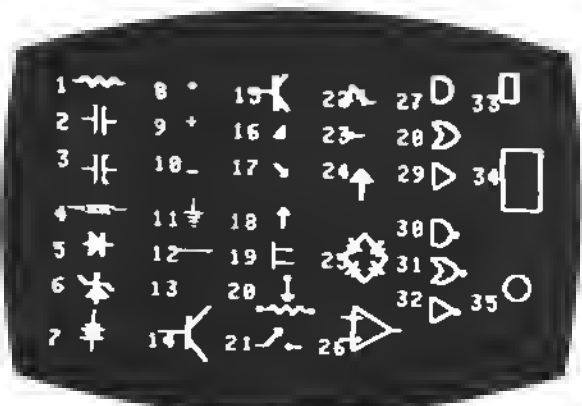
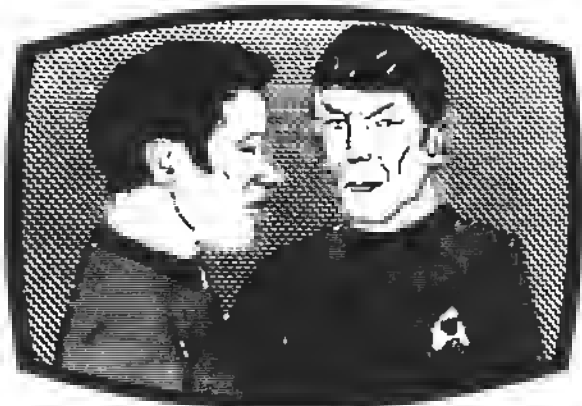
VISA/MASTERCARD accepted.  
\$1.00 shipping/handling charge.  
(California residents add 6% tax)



\*Apple II is a trademark of Apple Computer, Inc..



# VersaWriter



## What is VersaWriter?

VersaWriter is an inexpensive drawing tablet for the APPLE II that lets you trace a picture and have it appear on TV display.

VersaWriter is a comprehensive software drawing package which lets you color in drawings with over 100 different colors.

VersaWriter is a shape compiler that converts anything on the screen automatically into a standard shape table.

VersaWriter is a text writer for labeling pictures with text in six colors and five sizes. Use English or Greek, upper or lower case letters.

VersaWriter is much more! Draw with brush, create schematic drawings, compute area and distance, edit pictures, save, recall and more.

VersaWriter requires ROM APPLESOFT and 48K memory.

\$299 Suggested Retail

### UNIQUE OFFER

Send us YOUR disk and \$1. We will promptly return the disk with a slide package of 10 color pictures drawn with VersaWriter.

- ☐ Enclosed is \$1 and my disk. Send me the slide package.
- ☐ Send more information including VersaWriter dealers in my area.

**DEALER INQUIRIES INVITED.**

NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Send To: Versa Computing, Inc. • 887 Conestoga Circle • Newbury Park, CA 91320 • (805) 498-1956

# Applesoft Memory Map Display

**MEMAP is a short, exec file utility which creates memory maps of Applesoft programs without altering the memory contents.**

N.D. Greene  
Institute of Materials Science  
University of Connecticut  
Storrs, Connecticut 06268

Considerable memory space is needed for many engineering and business programs. Typically, these programs are long and use large data arrays with high-resolution graphics displays. Under these conditions, memory conflicts may occur and destroy the graphics picture, the program, or machine language routines. To prevent these problems during program development, it is necessary to know the location and length of the program and its variables. What's needed is a memory map. Although Apple Computer has published several memory maps (1-5), they are general and do not apply to specific programs. Also, some of the information is incorrect as noted by Peter Cook in an excellent two-part article in this magazine (6, 7).

There are several ways to map the Apple memory using the pointer addresses listed in table 1. These may be examined by immediate execution commands from the keyboard. For example, the end of a program can be determined by entering: PRINT PEEK(175) + PEEK(176)\*256 followed by a carriage return. In a similar fashion all of the addresses listed in table 1 can be examined. However, this is rather tedious.

Another approach is to write a short program containing lines similar to the above example and append it to the end of the program being studied. This, of

course, will lengthen the existing program and it is necessary to subtract the length of the appended portion to determine the original program length. A variation of this is to create a machine language program which examines and prints the contents of the pointer addresses. Machine language programs are "transparent;" they do not influence the pointer addresses. This is the method used by Cook (7) to develop memory maps. However, the machine language routine may overwrite the program in memory. If this occurs, the program will have to be re-entered after each memory examination.

The above difficulties can be avoided by using commands similar to the previous illustration *via* a disk exec file. If this file does not define variables or strings it can be used to examine memory locations without altering them.

## The Program

Running the program shown in listing 1 will create an exec file, MEMAP. Once the file is created, it is activated by the command: EXEC MEMAP. MEMAP prints the contents of the pointer addresses listed in table 1 and calculates the amount of memory

Table 1

Applesoft Pointer Addresses\*  
(Decimal)

	Low Byte	High Byte
HIMEM	115	116
Strings (end)	111	112
Arrays (end)	109	110
Arrays (start)	107	108
LOMEM (variables-start)	105	106
Program (end)	175	176
Program (start)	103	104

\* See reference 2.

## Listing 1

```

5 REM
      MEMAP EXEC CREATE
      BY
      N.D. GREENE
      1981

10A$ = "MEMAP";D$ = CHR$(4);Q$
    = CHR$(34)
20 PRINT D$;"OPEN";A$; PRINT D$;
    "WRITE";A$
30 PRINT "HOME:UTAB 1:HTAB 10:?"
    Q$"APPLESOFT MEMORY MAP"Q$
40 PRINT "UTAB3:?"Q$"MAX MEMORY:
    "Q$",49152"
50 PRINT "UTAB5:?"Q$"          HI
    MEM:"Q$",PEEK(115)+PEEK(116)
    *256"
60 PRINT "UTAB6:?"Q$"STRINGS----
    ----->"Q$";PEEK
    (115)+PEEK(116)*256-(PEEK(11
    1)+PEEK(112)*256)"
70 PRINT "UTAB7:?"Q$" "Q$",PEEK(
    111)+PEEK(112)*256"
80 PRINT "UTAB8:?"Q$"FREE MEMORY
    ----->"Q$";PEEK
    (111)+PEEK(112)*256-(PEEK(10
    9)+PEEK(110)*256)"
90 PRINT "UTAB9:?"Q$" "Q$";PEEK(
    109)+PEEK(110)*256"
100 PRINT "UTAB10:?"Q$"ARRAYS----
    ----->"Q$";PE
    EK(109)+PEEK(110)*256-(PEEK(
    107)+PEEK(108)*256)"
110 PRINT "UTAB11:?"Q$" "Q$";PEE
    K(107)+PEEK(108)*256"
120 PRINT "UTAB12:?"Q$"VARIABLES
    ----->"Q$";PE
    EK(107)+PEEK(108)*256-(PEEK(
    105)+PEEK(106)*256)"
130 PRINT "UTAB13:?"Q$"
    LOMEM:"Q$";PEEK(105)+PEEK(10
    6)*256"
140 PRINT "UTAB14:?"Q$" "Q$";PEE
    K(175)+PEEK(176)*256"
150 PRINT "UTAB15:?"Q$"PROGRAM--
    ----->"Q$";PE
    EK(175)+PEEK(176)*256-(PEEK(
    103)+PEEK(104)*256)"
160 PRINT "UTAB16:?"Q$" "Q$";PEE
    K(103)+PEEK(104)*256;UTAB16"
170 PRINT D$;"CLOSE";A$
  
```

Figure 1: MEMAP screen outputs obtained (A) before and (B) after running the following program: 10 DIM A (1000)  
20 A\$ = "TRIAL"  
30 A\$ = A\$ + A\$

(A) APPLESOFT MEMORY MAP	(B) APPLESOFT MEMORY MAP
MAX MEMORY: 49152	MAX MEMORY: 49152
HIMEM: 38400	HIMEM: 38400
STRINGS----->0	STRINGS----->10
FREE MEMORY----->36307	FREE MEMORY----->31278
ARRAYS----->0	ARRAYS----->5012
VARIABLES----->0	VARIABLES----->7
LOMEM: 2093	LOMEM: 2093
PROGRAM----->44	PROGRAM----->44
2049	2049

used by the program and its strings, arrays and variables. A few comments about the program listing may be helpful. The ASCII character code [34] for a quote mark is defined as a string in line 10 and later used to introduce quotes into the text file. Since exec files mimic keyboard input, they leave cursor marks on the screen as each command is executed. For aesthetic reasons, the program prints over these marks with a blank (line 70 for example). The question mark, ?, is a shorthand nota-

tion for the PRINT statement. It is used throughout this program.

### Output

Figure 1 illustrates the screen displays obtained when MEMAP is exec'd before and after running a short program. (Note: it is not possible to directly print the output because of the backspacing and overprinting used. A screen dump routine is required to obtain a printed copy. This is of little conse-

quence since permanent copies are rarely needed.) Programs start at location 2049 and progress upward. This program is located between 2049 and 2093 and is therefore 44 bytes long. Unless otherwise instructed, the computer sets LOWMEM at the end of the program and fills the spaces above it with the program variables. These are not defined until the program is run as shown by comparing figures 1A and 1B. This program has a single variable, A\$. Each floating point variable requires seven bytes of memory

## WHY DO UNNECESSARY SURGERY ON YOUR APPLE?

**S**ooner or later, you're going to need a 16K memory-expansion for your Apple. When you do, we suggest you buy it on the card that doesn't require poking about on the motherboard — nor removing a RAM chip, installing a strap, etc.

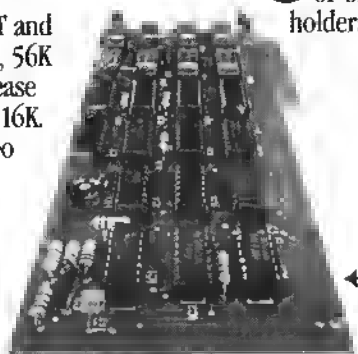
**T**he Ramex 16 RAM Board just plugs in. It's simple, reliable, and does its own memory refresh, with no additional connections.

**R**un Pascal, Fortran, FP, INT and other alternate languages, 56K CPM with a Z80 Softcard, increase usable memory for Visicalc by 16K. The possibilities are endless. Do it with the finest, closed-track engraved, epoxy sealed, 16K

board available — the Ramex 16. And do it without unnecessary surgery on your Apple.

**I**n spite of its quality, the Ramex 16 costs less than most other expansion boards — just \$139.95. And it comes with a *one year* limited warranty, instead of the usual 90 days.

**G**et the Ramex 16 from your local dealer, or order direct. Visa and Mastercard holders call toll-free, 1-800-835-2246.



**OMEGA MICROWARE, INC.**  
222 SO. RIVERSIDE PLAZA  
CHICAGO, IL 60606  
312-648-1944

*Look, ma,  
no straps!*

Apple and Applesoft are registered trademarks of Apple Computer, Inc. Pascal is a registered trademark of the Regents of the U. of C., San Diego. Visicalc is a registered trademark of Personal Software. CPM is a registered trademark of Digital Research, Inc. Z80 is a registered trademark of Zilog, Inc. Softcard is a registered trademark of Microsoft.



as confirmed by this map. Above the variable space, arrays are stored. Each floating point array requires seven bytes for indexing and five bytes for each array element. In this case, the total space needed is  $7 + (1001 \times 5)$  or 5012 bytes which is confirmed by figure 1B. Array space is not reserved until the program is run.

A 48K Apple has an upper memory capacity of 49152 bytes. The disk system (DOS) resets HIMEM to 38400 to protect its operating instructions. Below this point, redefined strings are stored; one byte for each string element. Line 30 in the example program redefines A\$ as A\$ + A\$ which contains ten letters. Defined strings (e.g. line 20) are stored in the program area rather than in the so-called string region. The free or unused memory is located between the upper end of the array memory space and the bottom of the string storage area, as shown.

If several redefined strings are used in a program, each one is entered at HIMEM, pushing previously stored strings downward. If this is repeated, the new strings are added at HIMEM and the previous strings, pushed downward, are left as residuals or "garbage." This effect can be illustrated by modifying the program used in figure 3 to repeatedly create new strings (figure 4). Here two variables, A\$ and I, are defined which require  $2 \times 7$  or 14 bytes. The redefinition of A\$ is repeated 2000 times, which consumes 20K of memory!

## Applications

Memory maps are interesting by themselves, but their real use is to assist in program development. For example, consider the program and map shown in figure 2. The string "garbage" extends down to 18400, which is within the area normally used

**Figure 2: MEMAP screen output obtained after running the following program:**

```
10 DIM A (1000)
15 FOR I = 1 TO 2000
20 A$ = "TRIAL"
30 A$ = A$ + A$
40 NEXT
```

```
APPLESOFT MEMORY MAP
MAX MEMORY: 49152
HIMEM: 38400
STRINGS----->20000
               18400
FREE MEMORY----->11260
               7140
ARRAYS----->5012
               2128
VARIABLES----->14
LOMEM: 2114
              2114
PROGRAM----->65
              2049
```

by high-resolution graphics, page two (16384 to 24575). Thus, it would not be possible to use HGR2 displays with this program without overwriting the graphics picture. This can be verified by adding a new line, 12 HGR2, and running the program. In a few moments, the Hi-Res screen fills with meaningless hash. However, figure 2 indicates that it should be possible to use page one of Hi-Res graphics, since it occupies the space between 8192 and 16383. Changing line 12 to HGR and running the program shows no evidence of overwriting: the screen remains black and clear.

Perhaps the most important aspect of using MEMAP in program development, is its educational value. In addition to showing that Hi-Res page one may be used without conflicts, figure 2 also suggests that redefined strings should be avoided or used sparingly. The string clearing effects of the FRE command can be seen by comparing before and after memory maps. Examining other programs with MEMAP suggests other ways to save space and/or to avoid memory conflicts. These include using integer rather than

floating point arrays, employing multi-statement program lines, and moving HIMEM and LOMEM to protect parts of programs.

## References

1. *Apple II Reference Manual*, Apple Computer Inc., 1978, p. 136.
2. *Applesoft II Basic Programming Reference Manual*, Apple Computer Inc., 1978, pp. 126, 127, 137.
3. *A Manual for Using the Apple Disk II with DOS Version 3.2*, Apple Computer Inc., 1979, pp. 140-142.
4. *The Applesoft Tutorial*, Apple Computer Inc., 1979, pp. 140-142.
5. *Apple II Reference Manual*, Apple Computer Inc., 1979, pp. 68-73.
6. Peter A Cook, *Apple Memory Maps, Part 1*, MICRO, No. 35, April 1981, pp. 27-35.
7. Peter A. Cook, *Apple Memory Maps, Part 2*, MICRO, No. 36, May 1981, pp. 45-56.

**MACRO**

Send for **FREE**  
Control Page  
Also Available soon on Atari

# EDIT 6502 T.M. LJK

**Two Pass Assembler, Disassembler, and Editor Single Load Program**  
DOS 3.3, 40/80 Columns, for Apple II or Apple II Plus\*

A MUST FOR THE MACHINE LANGUAGE PROGRAMMER. Edit 6502\* is a two pass Assembler, Disassembler and text editor for the Apple computer. It is a single load program that only occupies 7K of memory. You can move freely between assembling and disassembling. Editing is both character and line oriented, the two pass disassemblies create editable source files. The program is so written so as to encompass combined disassemblies of 6502 Code, ASCII text, hex data and Sweet 16 code. Edit 6502 makes the user feel he has never left the environment of basic. It encompasses a large number of pseudo opcodes, allows linked assemblies, software stacking (single and multiple page) and complete control of printer (paganation and tab setting). User is free to move source, object and symbol table anywhere in memory. Requirements: 48K of RAM, and ONE DISK DRIVE. Optional use of 80 column M&R board, or lower case available with Paymar Lower Case Generator.

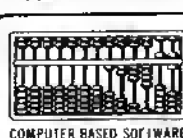
**TAKE A LOOK AT JUST SOME OF THE EDITING COMMAND FEATURES.** Insert1 at line #n Delete a character Insert a character Delete a line #n List line #n1, n2 to line #n3 Change line #n1 to n2 "string" Search line #n1 to n2 "string".

LJK Enterprises Inc. P.O. Box 10827 St. Louis, MO 63129 (314)848-6124

\*Edit 6502 T.M. of LJK Ent. Inc. — Apple T.M. of Apple Computer Inc.

**LOOK AT THESE KEY BOARD FUNCTIONS:** Copy to the end of line and exit. Go to the beginning of the line. abort operation: delete a character at cursor location go to end of line find character after cursor location: non destructive backspace: insert a character at cursor location: shift lock: shift release: forward copy: delete line number: prefix special print characters. Complete cursor control: home and clear, right, left, down up. Scroll a line at a time. Never type a line number again.

**All this and much much more — Send for FREE information.**  
Atari Cartridge \$199.95  
Apple Disk (Version 2) \$99.95



COMPUTER BASED SOFTWARE

ENTERPRISES

# Three minutes to find that "just right" property.

Search through up to 3600 property listings with Real-Soft programs for Real Estate Agencies.



No need to flip through endless pages of listings to find that "just right" property. Simply have your client specify the price range, number of bedrooms, preferred geographical location, acceptable house styles and up to 12 additional listing features. REAL-SOFT programs will find the right properties quickly and impressively giving you more time to view the selected properties and close the sale!

REAL-SOFT is an integrated set of computer programs designed specifically for real estate agency use. All routines are fully customizable to meet the requirements of virtually any agencies. Up to 10 different house styles, 12 different listing features and 16 different areas. Very easy to learn — included is a complete set of practice data to experiment with. Requires 48K Apple II, 2 disk drives and monitor. Printer is optional.

If printer is used a printout of selected properties can be output in only a few minutes for your client to view and discuss in detail.

Other useful routines in this powerful set of programs include a Property Availability Report, full Mortgage Amortization Tables (American OR Canadian method), and a Mortgage Comparison Analysis Report. Then use still another part of REAL-SOFT to estimate the replacement cost of any listing (using local factors), or to estimate the mortgage amount that your client can qualify for!

Available at your local Apple dealer.

**REAL-SOFT** Real estate software  
1450 West Georgia Street, Vancouver, B.C. V6G 2T8  
Telephone (604) 669-2262



# FOR YOUR FAVORITE APPLE



## "NO NONSENSE BOOKS" A GENERAL LEDGER SYSTEM FOR THE APPLE COMPUTER

- ★ WE'VE KEPT IT SIMPLE FOR YOU
- ★ EASY TO LEARN AND USE
- ★ SETUP AND RUN IN 10 MINUTES
- ★ 50 SUGGESTED ACCOUNTS
- ★ 5 PROFIT CENTERS
- ★ 2 CHECKING ACCOUNTS
- ★ JOURNAL AND CHECK RECORDS
- ★ BALANCES CHECKBOOKS
- ★ INSTANT PROFIT AND LOSS STATEMENTS
- ★ 1-7 MONTHLY REPORTS

APPLESOFT—2 DISK DRIVES,  
132 COL. PRINTER, 48K MIN. REQ. .... \$225.00  
DEMO DISK & HANDBOOK. .... \$10.00

## "DEPRECIATION" A LONG TERM ASSET MANAGEMENT PROGRAM

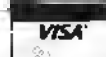
- ★ 2 CHECKING ACCOUNTS
- ★ REVIEWED IN SEPT. 81 CALL A.P.P.L.E.
- ★ 7 DEPRECIATION METHODS
- ★ RECORDS UP TO 800 ITEMS ON DISK
- ★ UP TO \$1 MILLION FOR EACH ITEM
- ★ 4 REPORTS ANYTIME
- ★ DEPRECIATION ON SCHEDULE
- ★ EQUIPMENT INVENTORY
- ★ RECOVERED COST LIST
- ★ DISPOSED EQUIPMENT LIST
- ★ FISCAL YEAR BASED
- ★ CONVERT METHODS ANYTIME

APPLESOFT ..... 32K MIN. .... \$225.00  
DEMO DISK & HANDBOOK. .... \$10.00



## MONEY DISK

P.O. BOX 1531 • RICHLAND, WA 99352 • 509-943-0198  
COMPUTER PROGRAMS FOR BUSINESS



WA Residents, add 5.3% sales tax

APPLE IS A REGISTERED TRADEMARK  
OF APPLE COMPUTER INC.



**LOGICAL SOFTWARE, INC.**  
PROUDLY PRESENTS:

## MAIL EXPRESS

A MAIL LIST PROGRAM FOR THE APPLE II.

An easy to use, powerful mailing list utility that can be used by companies or individuals to store the Name, Address, Telephone number of clients or friends.

MAIL EXPRESS provides User Definable Codes for City, State and Zip. These Codes shorten the time required by you to type in names to your mailing list and save room on the disk!

- Store up to 2,200 names per disk
- Sort a file in 30 seconds
- Prints Return Addresses
- Machine Language Find Routine will search for any information included in the file in seconds.

This is an easy to use professional quality mail list able to handle large or small files.

**Price \$49.95**  
**\$2.00 Postage & Handling**

Logical Software, Inc.  
P.O. Box 354  
Farmington, MI 48024  
(313) 474-8774



©Apple and Apple II are registered  
trademarks of Apple Computer Inc.

## OMEGASOFT 6809 PASCAL MEANS PRODUCTIVITY

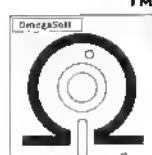
Now available for most 6809 operating systems is a compact single-pass compiler that quickly translates Pascal into optimized assembly language code. OmegaSoft Pascal is an ideal way to increase your programmers' productivity in all phases of program generation and maintenance.

The accepted syntax is based on the proposed ISO standard with extensions designed to interface to the real world. Byte wide variables can be manipulated to easily access I/O devices and complete support is provided allowing user defined interfaces to be used with the standard Pascal procedures. Dynamic length strings, long integers, and random disk files facilitate development of sophisticated applications programs for industry and business.

An interactive symbolic debugger is included to allow you to quickly execute your program. The debugger allows setting breakpoints at the start of Pascal statements, examining and changing variables, and to trace through one statement at a time. Utilities are provided to interactively create the control files used to automatically compile, assemble, and link the Pascal program to produce a totally position independent, reentrant, and relocatable object module.

OmegaSoft currently supports live at the most popular 6809 operating systems and OEM licenses can be arranged. Single unit domestic list price (\$81) for the compiler package is \$425 with quantity and dealer discounts available. For a data sheet and ordering information write or call:

**OmegaSoft**  
P.O. Box 70265  
Sunnyvale, CA 94086  
1 (408) 733-6979



# Applesoft Line Finder Routine

This 55-byte machine language program will display the bytes constituting a specified line in an Applesoft program. This program also demonstrates how you can use the subroutines available in Applesoft and the Apple Monitor.

Peter J. G. Meyer  
55 Sutter St., Suite 608  
San Francisco, California 94104

The Applesoft Interpreter (at \$D000-\$F7FF) and the Apple Monitor (\$F800-\$FFFF) contain many useful machine language subroutines which may be utilized by programmers. Most of these subroutines are documented briefly in John Crossley's article "Applesoft Internal Entry Points" in the first issue of *The Apple Orchard*.

One such subroutine is named FNDLIN (at \$D61A), and its task is to find the location, in memory, of a given line of an Applesoft program. To see why one might wish to do this, consider the following simple problem: how do you print "APPLE || PLUS" from within a program? This is easily reduced to two simpler problems: how to print "|" and "||"? The former is available on the Apple keyboard in the guise of shift-M, but the latter is not enterable from the keyboard. A solution is to include in your Applesoft program the line PRINT "APPLE |Z PLUS", and then replace the hexadecimal number which represents 'Z' (namely, \$5A) with the number which represents '|' (namely, \$5B). This requires examination of the region of memory containing the tokenized form

## Listing 1

```

*****
;
; LINE FINDER
;
; BY PETER MEYER
;
*****
;
;APPLESOFT SUBROUTINES
;
FNDLIN EQU $D61A
ADDON EQU $D998
REMN EQU $D9A6
LINGET EQU $DA0C
CHKCOM EQU $DEBE
;
;MONITOR SUBROUTINES
;
XAM EQU $FDB3
BELL EQU $FF3A
MCNZ EQU $FF69
;
;ZEROC PAGE LOCATIONS
;
A1 EPZ $3C
A2 EPZ $3E
LINNUM EPZ $50
LOWTR EPZ $9B
TXTPTR EPZ $B8
;
; CRG $300 ;RELOCATABLE
;
; CRJ $800
;
; JSR CHKCOM ;CHECK FOR COMMA
; JSR LINGET ;GET LINE NUMBER
; JSR FNDLIN ;SEARCH FOR LINE IN BASIC PROGRAM
; BCS FOUND
; JMP BELL ;NOT FOUND
; FCUNE LDA LOWTR ;STORE STARTING ADDRESS AT A1
; LEY LOWTR+1
; STA A1
; STY A1+1
; LDA LOWTR ;SET TXTPTR TO STARTING
; CLC ; ADDRESS + 4
; ADC #$04
; STA TXTPTR
; LEA LOWTR+1
; ADC #$00
; STA TXTPTR+1
; JSR REMN ;FIND END OF LINE
; JSR ADDON ;SET TXTPTR TO END OF LINE
; LDA TXTPTR
; LEY TXTPTR+1
; STA A2 ;STORE ENDING ADDRESS AT A2
; STY A2+1
; JSR XAM ;DISPLAY MEMORY FROM A1 TO A2
; JMP MCNZ ;ENTER MONITOR MODE
;
END

```

of the PRINT statement, locating the \$5A, and replacing it with \$5B. In the case of an Applesoft program composed of only a few lines, this can be done by direct inspection of memory using the Monitor. But, if your program has hundreds of lines, then another method is called for.

Given in listing 1 is a short, machine language program which is invoked [from BASIC command mode] by a statement of the form

CALL LOCATION, LINE

where LOCATION is the location (in decimal) of the machine language routine (it is relocatable), and LINE is the number of the line in the program to be searched for. If the routine finds the line, then it will display the bytes constituting the line and leave you in Monitor mode. (To return to BASIC command mode, enter Control-C.) If there is no line of the specified number in the Applesoft program, then the only result is a beep.

Suppose the routine is loaded or assembled at \$300 (decimal 768), your Applesoft program is in RAM, and you wish to find the location of line 3370, which is, say, PRINT "X". If you enter CALL 768,3370 then the bytes constituting the line will be displayed as follows:

```
xxxx- yy zz 2A 0D BA 22 5D 5A
      22 00
```

where xxxx is the address of the start of the line, yy zz is the pointer to the beginning of the next line (low-byte first), 2A 0D is the line number in hexadecimal (low-byte first), and 00 is the end-of-line token. The remaining five bytes are the tokenized form of the statement PRINT "X" (PRINT is represented by one byte: BA). If, for example, the address of the line is \$1A92 then [from Monitor mode] you can enter:

```
1A99: 5B
```

which has the effect of replacing the byte '5A' with the byte '5B'. If [after

Control-C-ing back to BASIC] the line is then LISTed, it will appear as PRINT "X", and will print accordingly.

For those readers without assemblers, the routine may be entered from Monitor mode by typing in 300: 20 BE DE 20 OC .... (See listing 1 for the remaining bytes.) Once entered, it may be saved to disk by entering BSAVE LINE FINDER, A\$300, L\$37. To use it, BLOAD LINE FINDER and proceed as above.

Apart from the utility, this routine is interesting because it relies almost entirely on subroutines in the Applesoft Interpreter and the Monitor, which is why it is only 55 bytes long. The five Applesoft subroutines and three Monitor subroutines which are used are given in listing 1 along with their addresses.

The routine works as follows: after you enter, e.g., CALL 768,3370, this statement is placed in the huffer (at \$200) and the zero page pointer TXTPTR is set to the first byte (the token for CALL). Upon invocation of the routine at location 768, TXTPTR is pointing to the comma, and the subroutine CHKCOM checks for this. [If there is no comma, a syntax error message results.] The routine then gets the line number using the subroutine LINGET, and places this (in hexadecimal form, low byte first) at LINNUM. The subroutine FNDLIN picks up this number and searches the Applesoft program for the line so numbered. If it does not find such a line, it returns with the carry flag clear. In this case the routine sounds the bell and returns to BASIC command mode.

If FNDLIN finds the line, then it returns with the carry flag set. It then deposits the address of the line at LOWTR (low byte first, as usual). The routine stores this address at AI, for later use by the subroutine XAM (eXAMine memory), which will display the bytes constituting the line.

Having found the address of the beginning of the line, the subroutines REMN and ADDON are used to find the address of the end. In order to use the subroutine REMN, which searches from the byte pointed to, by TXTPTR, until it finds an end-of-line token (00), the routine first sets TXTPTR to four places past the beginning of the line. This is to skip the link pointer and the line number, since the line number may contain 00 (as in 0A 00, representing 10), which would mislead REMN. REMN is then invoked, and returns

# LISP

for the Apple II

Pegasys Systems' new P-LISP interpreter is a full implementation of the well-known Artificial Intelligence language. Written in machine code, this powerful interpreter includes the following features:

- Over 55 functions implemented
- Extensive 45-page User Manual
- Full function trace
- Function editor and pretty-printer
- Floating point math
- Break mode for function debugging
- Detailed error messages
- Lores and Hires graphics
- PROG construct, EXPRs, and FEXPRs
- Atom property lists
- ELIZA, TOWERS OF HANOI, and other sample programs included

**Also available:** The P-LISP Tutorial, an introductory text designed to give the reader a complete understanding of the LISP language.

P-LISP is supplied on disk with User Manual for \$99.95 (specify DOS version). The manual is available separately for \$10.00. The P-LISP Tutorial is available for \$15.00. Requires a 48K Apple II or II+ with disk. Floating point math and Hires graphics require Applesoft in ROM.

## PEGASYS SYSTEMS, INC.

4005 Chestnut Street  
Philadelphia, PA 19104

**Orders only: 800-523-0725**

PA residents and inquiries: (215) 387-1500

Pennsylvania residents add 6% sales tax

Apple is a trademark of Apple Computer, Inc.



**Good software is no longer a myth.**




with the offset to the end-of-line in the Y register. ADDON adds this offset to TXTPTR, so that TXTPTR is then pointing to the end of the line. This address is stored at A2, and XAM is invoked to display the bytes from A1 to A2.

Readers wishing a fuller understanding should consult the aforementioned article by John Crossley, and the Apple manual entitled *Apple II Monitors Peeled*, for details of the subroutines given in listing 1.

While studying mathematics and philosophy in the late 1960's, Peter Meyer wrote programs in FORTRAN for scientific and technical applications. He acquired an Apple in early 1980 and proceeded to develop the memo program *Agenda Files* (Special Delivery Software). Currently he is studying the internals of Applesoft, and is designing a system for interfacing Applesoft programs with machine language subroutines.

MICRO

# WANTED

## SOFTWARE AUTHORS!

for Apple, Atari, TRS-80, NEC, Hitachi. . .

Brøderbund Software is looking for new authors to join its international team of programmers. If you have a product for the micro market, let us show you the advantages of working with our team of design, production and distribution specialists.

Call or write for our free Authors Kit today or send us a machine readable copy of your work for prompt review under strictest confidence.


Brøderbund Software

#2 Vista Wood Way, San Rafael, CA 94901 (415) 456-6424

## NEW

DEALER INQUIRIES INVITED!!

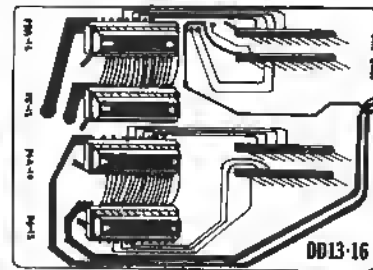
201-839-3478



## DOUBLE DOS PLUS

for Apple Computers

### \$39.00




DD13-16

**DOUBLE DOS Plus**—a piggyback board that plugs into the disk-controller card so that you can switch select between DOS 3.2 and DOS 3.3. Works with the language system eliminating the need in many cases to boot the BASICs disk. Also eliminates the chore of converting all of your 3.2 disks to 3.3

NOTE: APPLE is a registered trademark of APPLE Computer, Inc., Cupertino, CA.

**WHY IS DOUBLE DOS Plus better?**

- Nothing needs to be soldered, just plug in and go.
- Since all four ROMs are used, all software will work, even early 3.1 DOS.
- Because the ROMs fit on the back of the board, it has the thinnest configuration allowing full use of slot #7
- One set of ROMs is powered up at a time, thus saving power. DOUBLE DOS Plus requires APPLE DOS ROMs
- Full 90-day warranty from TYMAC.



### MICRO-WARE

DISTRIBUTING INC.

P.O. BOX 113

POMPTON PLAINS, N.J. 07444



### OTHER UNIQUE PRODUCTS FROM MICRO-WARE DISTRIBUTING INC.

**THE APPLE CARD**—Two sided 100% plastic reference card for the Apple computer. Loaded with information of interest to all Apple owners. \$3.98

**PARALLEL PRINTER CARD**—PPC-100—A Universal Centronics type parallel printer board complete with cable and connector. This unique board allows you to turn on and off the high bit so that you can access additional features in many printers. Use with EPSON, ANADIX, STARWRITER, NEC, SANDERS, OKI, and other with standard Centronics configuration. \$139.00




**THE DOUBLE BOOTER ROM**—Plugs into the empty D8 Socket on the Apple motherboard or the Integer ROM Card to provide a 13 sector boot without using the BASICs Disk. DoubleBooster may also be used in the MOUNTAIN HARDWARE ROM PLUS board. This chip will not work in a plus machine unless it contains an Integer board or a ROM Plus board. \$29.00

**DISK STIX**—Contains 10 dozen diskette labels with either 3 3 or 3 2 designation. Room for program names and type also. \$3.98

\*\*\*\*\* **SOFTWARE** \*\*\*\*\*

**SUPER SEA WAR**—Hires battleship type simulation. \$13.95

**ULTIMATE XFER**—A telephone software transfer program, uses DC Hayes Assoc. modem. \$25.00

**ROAD RALLYE**—Hires driving game with 5 different full screen tracks. \$15.00

**MISSILE CHALLENGER**—Hires arcade type game where you defend your cities from falling missiles. 8 levels & writes name & high score to disk. \$19.95

**SUPER PIX**—Hires screen dump for the EPSON MX-80, inverse or normal, larger than full page graphics in 2 orientations. Needs Tymec PPC-100 Printer board or we will upgrade your EPSON board for \$25. \$39.95

**GRAPH-FIT**—A hires graphing program that produces bar charts, pie charts and line graphs. Has auto scaling feature too. \$25.00

### STILL MORE APPLE GOODIES

**APPLE KEYBOARD SYNTHESIZER**—49 note (C to C) AGO Keyboard with 3 sawtooth sq wave shapers; 3 audio oscillators, 3 low pass filters, 4-64 point shape controllers, 2 envelope generators. Complete system. \$995

**KEYBOARD ONLY** with Apple Interface. \$649

**GRAPHIC NOTEWRITER**—Hires note write for synthesizer system. \$99

**SUPER PIX OKI**—Hires screen dump for OKI Microline 80, 82, 83 Printers. Same features as super pix. Needs Tymec PPC-100 Board. \$24.95

**NIBBLES AWAY**—The best disk back up program to date. Allows you to make backup of most every disk ever produced for the Apple. Over 10 user defined parameters including synchronized & unsynchronized copies as well as automatic half tracking and raw data transfer. \$59

Call 201-839-3478 for Dealer & Distributor Inquiries.



user "stack," which is a series of memory locations used for most language operations and much data storage.

A pointer to the next available location is constantly maintained as values and addresses are PUSHed onto it or POPped from it. Most operations act on one or both of the top two entries, removing them and replacing them with the result of the operation. For instance, to add 5 and 3, you would first PUSH a 5 onto the stack, then PUSH a 3, and finally invoke the + operation which would POP both the 5 and the 3 and leave only the result of the operation on the stack: an 8.

RPL provides all of the necessary stack operations, including ones that allow rolling an entry to the top from a specified depth and interchanging the top two entries. It allows conditional branching, Boolean operations, PEFKs and POKEs and their 16-bit equivalents, subroutines, nested FOR...NEXT loops, nested IF...THEN...ELSE constructions, random numbers, GET, INPUT and even the dreaded GOTO. Character string manipulation and printing take a little extra effort, but are straightforward. The RPL operations actually end up allowing more flexibility.

Surely there must be some things missing. But of course! Numbers may only be 16-bit integers (-32768 to 32767, or 0 to 65535), although routines to handle floating point numbers and larger integers could certainly be written. The built-in file-handling capabilities of BASIC are not duplicated. Also, all of the higher mathematical functions, like trig functions, square roots, and such, are lacking.

Line numbers are used only in editing and error detection. They have no meaning in the program flow. Instead you use symbols to label parts of your program. Symbols may be defined globally or locally, making the development of a subroutine library very easy. It is also possible to use symbolic constants, which can be defined at "compile time."

One big advantage of RPL is that it uses the PFT editor, so you don't have to get used to a different, less powerful editor. BASIC and the PFT's machine language monitor are available while RPL is present, so it is easy to load and save both source and object files. Inclusion of machine language routines for

A program to fill the screen with PET characters.  
The BASIC version runs considerably slower than the RPL version.

#### Economy BASIC Version

```
10 FOR J=0 TO 999:POKE32768+J,1AND255:NEXT
```

#### Source for RPL Version

```
10 32767 32768 FOR FN # POKE NEXT
```

the ultimate in speed and economy of space is also very easy, especially with the forthcoming Samurai assembler which will use the same symbol table structure as RPL. Interfacing to BASIC is possible too, but the process is a little more involved.

If you have never spent much time with H-P calculators or FORTH, stack manipulation might be a little confusing. Samurai Software has available a program called "SIM," a symbolic debugger for programs written in RPL, which can be included on the same disk or cassette with RPL. Not only does this allow stepping through a program, setting breakpoints, PUSHing, PULLing, and setting the PC, but it also shows each operation before it is executed and then shows the results of the contents of the stack. This program is almost essential for debugging, since the only runtime error message is "P!" to indicate stack over- or underflow. It also illustrates the intricacies of stack manipulation very nicely.

The documentation is about the best I have ever seen. The manual begins with enough information to get anyone programming quickly, followed by a section on more advanced techniques. (There are appendices with other information.)

RPL is not a standard language, although it has more in common with FORTH than any other. Instead of the "threaded" structure of FORTH, RPL uses a P-code structure like Pascal. RPL is generally faster and more conservative of memory than FORTH. FORTH can be applied on nearly every computer, while you can use RPL only on a CBM/PET. FORTH's portability has a cost, in that routines that already exist in the PFT's ROMs (or any other machine's operating system) must be

duplicated, thus eating up valuable memory.

RPL will serve well the need for a language that is faster than BASIC yet easier to program than assembly language. The package is well-thought-out and well-documented. RPL is more difficult to program than BASIC and more difficult to read, but it does have many elements of the structured languages like Pascal. Its intimacy with the PET operating system is an advantage over FORTH in speed and memory conservation, but it makes it impossible to run on a non-PET.

RPL is available from Samurai Software (P.O. Box 2902, Pompano Beach, FL 33062) for \$49.95 on disk or \$44.95 on cassette. Specify your ROM and disk drive types.

#### Commodore Announces New Products

Six new books dealing with various aspects of the new SuperPET system are now available:

1. System Overview	\$ 5.95
2. Waterloo microAPL	\$ 9.95
3. Waterloo microBASIC	\$10.95
4. Waterloo microFORTRAN	\$10.95
5. Waterloo microPascal	\$10.95
6. Waterloo 6809 Assembler	\$10.95

A new high-speed printer, the CBM 8023P, is now available for \$995. It features bidirectional printing at 150 cps in up to 136 columns, and both tractor and friction feeds. Upper and lower case are available, as well as PET graphic characters and user-defined characters. There is also RAM available for formatting data.

**MICRO**

# Take Charge!! . . . ...EASILY!



Take charge of your growing collection of disk-based software.

## Introducing: **Disk Library**<sup>®</sup> The Software Management System<sup>®</sup>

**Disk Library** is an elegant, user-oriented system for creating and maintaining a thorough, cross-referenced Index of all your disk-based programs and data files. It provides for **Automatic** entry into your Library file of the full catalog of any Apple\* diskette. Disks formatted under other operating systems (such as Pascal and CP/M\*) are easily entered from the keyboard. Written entirely in machine code, **Disk Library's** operation is both smooth and swift.

### EASY TO OPERATE:

- Menu-driven
- Single keystroke operation
- Full featured **Editing**
- Super fast **Sorts** by any field (1200 items sorted in 4 seconds!)
- Works with all disks created under DOS 3.1, 3.2 and 3.3
- User definable **Program Types** (e.g., Business, Game, Utility) of up to 15 characters each can be assigned to each program entry with single keystrokes or via block actions
- On screen and printed **Summaries**, by File Type (Integer, Applesoft, Binary, Text) and by Program Type (e.g., Accounting, Graphics, Music)
- Effortless data entry
- User-definable prompt defaults
- **Block Actions** (global editing/deleting)
- Instant **Searches...** by full or partial string (find any item in 1/3 sec.!)
- New files can be **Appended** to existing records, in memory or on disk
- **Unique Feature:** User can redefine the Disk Volume Number displayed by the DOS Catalog Command
- A Unique Volume Identifier and Disk Title can be assigned to each disk entry in your Library file.
- Printed **Reports** are attractively formatted for easy readability

### EASY TO LEARN:

- A 75 page, professionally prepared User's Manual is provided; including:

- Introductory Tutorial, will have you using Disk Library in 10 minutes
- Advanced Tutorial, enables you to master **Disk Library's** many advanced features
- Reference Section, provides quick answers for experienced users
- Applications Section, gives you many ideas for maintaining your library
- Index, enables you to find whatever you need

### EASY TO ORDER:

The **EASY** WAY: send check or money order to:

**MODULAR  
MEDIA**

The **EASIEST** way: use your Visa or MasterCard —**ANY DAY, ANY TIME**—



### TOLL FREE:

(Orders Only): **1-800-331-1750**, ask for Operator **948**, Dept. **400**.  
(In Okla.): 1-800-722-3600, ask for Operator 948

### PRICE:

Special Introductory Offer (Until Feb. 28, 1982) - **\$39.95**.  
Regular Price - **\$49.95**

### WHAT YOU NEED:

- A 48K Apple II or II+
- A disk drive, with DOS 3.3
- A printer (optional but desirable)
- A desire to get organized!

**INQUIRIES**, please call or write:

**MODULAR  
MEDIA**<sup>®</sup>

11060 Paradel St., Miami, FL 33156 (305) 661-7310

*Developers/Publishers of Innovative Software*

\* Apple, Apple II and Apple II+ are registered trademarks of Apple Computer, Inc.  
CP/M is a registered trademark of Digital Research, Inc.

# Applesoft and Matrices

This machine language program performs the most commonly used special matrix operations, as well as most Applesoft operations. The program can be linked to Applesoft by means of the & statement. Two advantages of using this program rather than a BASIC subroutine are a significant increase in execution speed (on the average a factor 5) and greater convenience. The required system configuration for the program is a 48K Apple with Applesoft in ROM (or in the Language Card).

Cornelis Bongers  
Erasmus University  
Postbox 1738  
3000 DR Rotterdam,  
The Netherlands

For those who are not accustomed to working with matrices, a matrix is a block of numbers. Several operations can be performed on a matrix or a pair of matrices. For instance, adding two matrices A and B together, we obtain a matrix C, whose elements consist of the sums of the corresponding elements of A and B. Thus if,

$$A = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 1 & 4 \\ 4 & -2 & 1 \end{bmatrix}$$

and

$$B = \begin{bmatrix} 2 & 4 & 7 \\ 1 & 8 & -6 \\ 5 & 0 & 1 \end{bmatrix}$$

then the sum of A and B is

$$C = \begin{bmatrix} 3 & 7 & 12 \\ 3 & 9 & -2 \\ 9 & -2 & 2 \end{bmatrix}$$

It will be clear that A, B, and C can be represented by three 2-dimensional arrays in BASIC. When A and B have to be added, the following BASIC routine may be used:

```
100 FOR I=1 TO N: FOR J=1  
    TO M: C(I,J)=A(I,J)+B(I,J):  
    NEXT J, I
```

where N and M are both equal to 3 in our example. When using the machine language program, this routine can be replaced by the statement:

```
100 & C=A+B
```

Note that by using the latter statement, the names of the matrices are irrelevant. In the BASIC routine the names of the matrices always must be A, B, and C to comply with the names of the BASIC arrays.

## Applesoft Operations

Except for comparison, SCRN(), and CHR\$, all the Applesoft operators and functions that can be used on real variables or expressions are available for matrix operations. There are, however, some restrictions on the syntax of the matrix statement. First, no more than 3 matrices may be used in a matrix statement. Second, single-valued expressions (or variables) must be put between brackets. Another restriction is that matrices used in an & statement must have two dimensions. Each of these dimensions must be larger than 0 and smaller than 255. Furthermore, each matrix appearing in an & statement must have been dimensioned previously by means of a DIM statement. For the exact syntax of the matrix statement we refer to the 'Instructions' section of the article. Some examples are listed below.

Example 1:

```
10 DIM A(10,10): B=1  
20 &A=(B): A=RND(A):  
    A=A*(10): A=INT(A)
```

In this example, the array A is set equal to 1. Next, the RND function is performed on all elements of A, so that A now contains random numbers between 0 and 1. Then A is multiplied by 10, and the INT function is executed on each element of A. After the execution of line 20, A is thus filled with random numbers between 0 and 9. Note that the statement A=(RND(1)) puts all elements of A equal to the same random number.

Example 2:

```
10 DIM A(5,6), B(5,6), C(5,6)  
20 B=3  
30 &A=(3): B=(2): C=A*B:  
    C=C^(B)
```

The statement C=A\*B multiplies the corresponding elements of A and B and stores the result in the corresponding elements of C. After the execution of this statement, all elements of C are therefore equal to 6. Note that for a successful execution of the statement, A, B, and C must have the same dimension (or order). By means of the last statement, all elements of C are raised to the third power. If, instead of the statement C=C^(B), the statement C=C^A is used, all elements of C will become equal to the second power of 6, because now the matrix B instead of the variable B is taken.

## Matrix Operations

Although the operations and functions used in the examples above can be handy sometimes, they hardly justify the writing of a machine language program. The real usefulness of the program is, therefore, not its ability to perform Applesoft functions and operations, but rather to handle some specific

matrix operations as well. The following operations are implemented:

1.  $A = \text{IDN}(aexpr)$  where A must be a square matrix and  $1 \leq aexpr \leq N$  if N is the order of A. This statement puts A equal to a matrix consisting of zeros and ones. If *aexpr* equals one, A becomes the identity matrix. For larger values of *aexpr*, the columns of the identity matrix will be rotated *aexpr* - 1 positions to the left. For instance, if A and B are square matrices of order 3, then  $A = \text{IDN}(1)$  and  $B = \text{IDN}(2)$  return.

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$B = \begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$$

2.  $A = \text{TRN}(B)$  puts A equal to the transpose of B. If B is of order p by q, then A must be of order q by p. Putting a matrix equal to its own transpose (i.e.  $A = \text{TRN}(A)$ ) is not allowed. For instance, if B equals,

$$B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 0 \end{bmatrix}$$

then  $A = \text{TRN}(B)$  will return

$$A = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & 0 \end{bmatrix}$$

3.  $A = B.C$  puts A equal to the matrix product of B and C. If B is of order p by q, then the first dimension of C must equal q. In case the second dimension of C equals r (thus C is q by r), the matrix A has to be of the order p by r. Furthermore, the matrix on the left of the "=" sign may not equal one of the matrices on the right of the "=". As an example, we can multiply the matrices A and B in the example above by means of the statement  $C = A.B$ . This leads to

$$C = \begin{bmatrix} 35 & 14 \\ 14 & 20 \end{bmatrix}$$

4.  $A = \text{MIN}(B)$ ,  $A = \text{MAX}(B)$  or  $A = \text{ABM}(B)$  put A respectively equal to the minima, the maxima, or the absolute maxima of the columns of B. The overall maximum, minimum, or absolute maximum of B is stored in  $A(0,1)$ . If B is of order p by q, then A must be of order q by 1.

5.  $A = \text{INV}(B)$  puts A equal to the inverse of B and stores the determinant of B in  $A(0,0)$ . A and B must be square and of the same order. The statement  $D = \text{INV}(C)$ , where C equals the matrix above, returns for instance,

$$D = \begin{bmatrix} .0396825397 & -.0277777778 \\ -.0277777778 & .0694444444 \end{bmatrix}$$

At the execution of the inverse statement, values stored in the 0th row of the target matrix will be destroyed since this row is used to store some pointers. To obtain the inverse of a matrix A, the statement  $A = \text{INV}(A)$  also may be used. Finally, zeros on the main diagonal of the matrix to be inverted are allowed.

6.  $A = \text{NEINV}(B)$  gives the same result as  $A = \text{INV}(B)$  except that the program continues if a division by zero occurs when B is singular. When using NEINV, it is recommended to check the determinant of B (in  $A(0,0)$ ) after execution of the statement. When B is singular, the determinant will be zero.

7.  $A = \text{PNT}(aexpr)$  displays the matrix A. For each element of A, *aexpr* positions are reserved, and a carriage return is generated after each row. If *aexpr* equals zero, the elements of A are separated by a blank.

## An Application

An interesting application of matrix algebra is the linear model. The linear model can be used to analyze the influence of a number of variables, called the independent variables, on another variable, called the dependent variable. The model has the form,

$$y = b_0 + b_1 x_1 + b_2 x_2 + \dots + b_m x_m + u$$

where y denotes the dependent variable, and  $x_1, x_2$ , etc., denote the independent variables.

The last term, u, represents the influence of factors that were not included in the model. Usually this term is called the residual. As an example, suppose that we want to establish the relationship between the annual regional sales of a particular product (y), the number of times advertised ( $x_1$ ) and the number of people living in the region ( $x_2$ ). The available data are given in the table below.

Obs. No.	Y Sales	X <sub>1</sub> Advert.	X <sub>2</sub> Popul.
1	118	8	583
2	138	9	692
3	104	5	1082
4	65	1	836
5	46	1	628
6	61	2	244
7	48	1	632
8	66	2	172
9	78	5	319
10	69	2	383

In matrix algebra the model can be written as,

$$Y = X.B + U$$

where B (the unknown coefficients) is of order 3 by 1 and Y (the sales), and U (the residuals) are of order 10 by 1. The matrix X is of order 10 by 3. The elements of the first column of X are equal to one (to account for  $b_0$ ) whereas the second and third columns correspond to the columns under the heading  $X_1$  and  $X_2$  in the table. To fit the equation to the data, the least squares principle is used, which means that the coefficients are chosen such that the sum of the squares of the elements of U is minimized. This leads to the following solution for B,

$$B = (X'.X^{-1})X'.Y$$

where  $X'$  denotes the transpose of X. A BASIC program to compute the least squares solution is presented in listing 1, with the results of the example. The least squares equation shows that the sales increase by 9.5 for each additional advertisement (other things being equal) whereas an increase of 100 in the population of the region increases the sales by 1.6 (other things being equal).

The application given in this section was kept simple purposely. The linear model, for instance, can easily be extended with a tremendous amount of statistics which may (or may not) simplify the analysis of the data. Also the application presented gives only a narrow view on the wide field of problems in which matrix algebra may be useful. Examples include computations with Markov-type problems and the location of the maximum (or minimum) of a function of several variables by means of the Newton method.

## The Machine Language Program

The hex dump of the program is presented in listing 2. As can be seen, it

is about \$700 bytes long and starts at \$8900. The end is at \$8FF2, which means that the area \$9000-\$9600 is free for other routines.

After the hex dump has been keyed in and saved, the program can be connected to an Applesoft program by means of the command : BRUN program name or, if you don't have a disk, by the monitor command : 8900 G. In the latter case you must enter Applesoft via the warm start (i.e., Control-C). The BRUN or 8900 G command executes the initialization routine at the start of the program that sets HIMEM to the appropriate value and installs the & vector. In case the & vector is destroyed during execution of a program, the matrix program can be reconnected by the command CALL 35072.

The program extensively uses zero page locations to increase execution speed. However, as a consequence, the ON ERR flag will be temporarily cleared during the execution of an & line since the matrix routines use the storage space of the ON ERR pointers. After the execution of the & line, the ON ERR flag and pointers are restored to their original values. Apart from zero page locations, the control Y and the & vector are used, which implies that values stored at \$3F5 - \$3FA will be destroyed.

### In Case of an Error

If the interpreter returns an error message during the execution of an & line, there is either a bug in your statement or a bug in my program. In the first case, the error is probably caused by the violation of one of the following conditions:

1. Only matrices containing reals are allowed in the & line.
2. Matrices used in an & statement must have 2 dimensions.
3. Each dimension of a matrix must be larger than 0 and smaller than 255.
4. The orders of the matrices should satisfy the conditions in the "instructions" section of this article.
5. Each matrix appearing in an & statement must have been dimensioned earlier in the program by a DIM statement.
6. ON ERR doesn't work during the execution of an & line.

Although the other case (i.e. a bug in my program) seems at this time highly improbable to me since the program was heavily tested for several months, I am

well aware that there are some kinds of bugs that can, as it seems, only be discovered by other people. Therefore, if you find one, I would appreciate it very much if you let me know.

Finally, a utility package which contains, among others, the matrix program, will be released soon. This utility package resides in the second 4K bank of the Language Card, and it will use only \$300 bytes of 'normal' RAM.

### Instructions

This section contains the matrix expressions that can be executed by means of the & line. The syntax of the line is:

& matrix expression: matrix expression: etc.

The following operators and functions may be used:

operator := +, -, \*, /, ^  
AND, OR

function := SGN, INT, ABS,  
USR, FRE, PDL, POS,  
SOR, RND, LOG, EXP,  
COS, SIN, TAN, ATN,  
PEEK

## The powerful package:

### Super-Text II™

Allows you to learn the basics of text editing quickly. Advanced features will meet your expanding word processing requirements far into the future. \$150.00

### plus Form Letter™

Stores names, addresses, and telephone numbers and prints mailing labels. Has user-definable category system. \$49.95

### plus Address Book™

Provides automatic repetitive printing of letters. Allows insertion anywhere in a letter, also direct entry, optional prompting, special commands. \$100.00

**From the leader in word processing  
for the Apple II or II Plus**

**MUSE** SOFTWARE™

330 N. CHARLES STREET  
BALTIMORE, MD 21201  
(301) 659-7212

Apple II is a trademark of Apple  
Computer Corp.

Call or write for information and  
the name of your nearest MUSE dealer

Unless stated otherwise, matrices appearing in an & statement must have the same order, and matrix names on the left of the "=" sign can be chosen equal to matrix names on the right of the "=". The matrix expressions that are allowed are listed below.

#### I. Applesoft Operations and Functions with:

- 1.1 1 matrix and 1 expression  
A = (aexpr)

Example:  
A = {-1/2}, B={Z%}

- 1.2 2 matrices

A = B  
A = -B  
A = NOT B  
A = function(B)

Example:  
A = SIN(B)

- 1.3 2 matrices and 1 expression  
A = B operator (aexpr)

Example:  
A = B ^ (COS( 3))

- 1.4 3 matrices  
A = B operator C

Example:  
A = B/C

#### II. Specific Matrix Operations

- 2.1 A = IDN(aexpr) — Identity: A must be square and  $1 \leq aexpr \leq$  order of A.

- 2.2 A = TRN(B) — Transpose: if B is of order p by q, then A must be of order q by p. A=TRN(A) is not allowed.

- 2.3 A = B.C — Multiplication: if B is of order p by q and C of order q by r, then A must be of order p by r. A=A.C or A=C.A is not allowed.

- 2.4 A = MIN(B), A = MAX(B), A = ABM(B) — Minimum, maximum or absolute maximum: if B is of order p by q then A must be of order q by 1. After execution A(0,1) contains the overall minimum, maximum or absolute maximum of B.

- 2.5 A = INV(B) — Inverse: A and B must be square and of the same order. After execution, A(0,0) contains the determinant of B.

- 2.6 A = NEINV(B) — Inverse: same as INV, except that singularity of B doesn't stop the program.

- 2.7 A = PNT(aexpr) — Print: if aexpr=0 the elements are separated by a blank, else aexpr positions are reserved for each element.

Cornelis Bongers is an assistant professor of statistics at the Erasmus University in Rotterdam, The Netherlands. He uses his Apple for solving statistical problems, such as likelihood maximization and the estimation of the parameters of density functions. As a hobby, he develops machine language utility programs for the Apple to extend Applesoft, via the & instruction, with several functions that are not implemented, such as PRINT USING, Sort and Storing and Recalling arrays to or from disk.

#### Listing 1

```
5 REM THE LINEAR MODEL
10 HOME
20 INPUT "NUMBER OF OBSERVATIONS ? ";N
30 INPUT "NUMBER OF INDEPENDENT VARIABLES ? ";M:M1 = M + 1
40 IF M1 > N THEN PRINT "TOO FEW OBSERVATIONS": STOP
50 DIM X(N,M1),XA(M1,N),Y(N,1),B(M1,1),EA(I,N),S(M1,M1)
60 DIM V1(1,1),V2(1,1),H(M1,1),J(1,N)
70 PRINT "INPUT THE ELEMENTS OF THE Y-VECTOR": PRINT
80 FOR I = 1 TO N
90 PRINT "ELEMENT ";I;" ? "; INPUT "Y(I,1)";X(I,1) = 1
100 NEXT I
110 FOR J = 2 TO M1
120 PRINT "INPUT THE ELEMENTS OF THE X";J;"-I;" VECTOR": PRINT
130 FOR I = 1 TO N
140 PRINT "ELEMENT ";I;" ? "; INPUT "X(I,J)";
150 NEXT I,J
160 REM CALCULATE RESULTS
170 & XA = TRN(X):S = XA.X:S = NEINV(S):H = XA.Y:B = S.H
180 IF S(0,0) = 0 THEN PRINT "THE S-MATRIX IS SINGULAR": STOP
190 PRINT "THE LEAST SQUARES EQUATION EQUALS": PRINT
200 PRINT "Y = ";B(1,1);
210 FOR J = 2 TO M1: IF B(J,1) > 0 THEN PRINT "+";
220 PRINT B(J,1);"X";J;" ";
230 NEXT J: PRINT " "
240 & E = X.B:EA = TRN(E):E = Y - E
250 PRINT "*** THE TABLE OF RESIDUALS ***": PRINT
260 PRINT "NO"; TAB(4);"OBSERVED Y"; TAB(16);"ESTIMATED Y"; TAB(29);"RESIDUAL"
270 FOR I = 1 TO N
280 PRINT I; TAB(4);Y(I,1); TAB(16);EA(1,1); TAB(29);E(I,1)
290 NEXT I: PRINT
300 & EA = TRN(E):V1 = EA.E
310 PRINT "STANDARD DEV. RESIDUALS: "; SQR (V1(1,1) / (N - M1))
320 & J = (1):V2 = J.Y:V2 = V2 / (N):E = Y - (V2(I,1)):EA = TRN(E):V2 = EA.E
330 R = (V2(1,1) - V1(I,1)) / V2(1,1): IF R < 0 THEN R = 0
340 PRINT "R^2"; TAB(24); PRINT " "; SQR (R)
350 END
```

#### Output of the Example

THE LEAST SQUARES EQUATION EQUALS  
Y = 35.9942408+7.5468773\*X1+.0120419893\*X2  
\*\*\* THE TABLE OF RESIDUALS \*\*\*

NO	OBSERVED Y	ESTIMATED Y	RESIDUAL
1	118	121.721758	-3.72175834
2	138	133.017215	4.98278511
3	104	101.086072	2.91392821
4	65	58.952235	6.0477649
5	46	55.6154898	-9.61548973
6	61	59.0022456	1.99775441
7	48	55.6796577	-7.6796577
8	66	57.8472224	8.15277764
9	78	38.846034	-10.046034
10	69	61.0320821	7.7679179

STANDARD DEV. RESIDUALS: 8.31192607  
R^2 : .971018065

(Continued on next page)



# Listing 2: Hex Dump

8900-	A9	00	85	73	A9	89	85	74	8DA0-	A5	A1	F0	F5	C5	F4	B0	F1
8908-	A9	73	8D	F6	03	A9	89	8D	8DA8-	85	FF	20	E0	8A	A5	1E	85
8910-	F7	03	60	A8	49	44	CE	50	8DB0-	9B	A5	1F	85	9C	A6	FF	CA
8918-	4E	D4	4E	45	49	4E	D6	49	8DB8-	A0	00	20	75	8B	A2	06	20
8920-	4E	D6	54	52	CE	4D	49	CE	8DC0-	48	8B	A9	06	A0	F1	20	F9
8928-	4D	41	D8	41	42	CD	00	8D	8DC8-	EA	A2	1E	20	36	8B	C6	F4
8930-	8E	8C	F1	8D	EC	8D	EF	8C	8DD0-	F0	1A	A6	1E	A4	1F	20	2B
8938-	FC	8B	9C	8B	9F	8B	A2	00	8DD8-	EB	E6	FF	A5	F5	C5	FF	D0
8940-	00	00	00	00	A9	8A	48	A9	8DE0-	E8	A2	1E	20	48	8B	20	48
8948-	CB	48	FA	11	8D	F9	03	A9	8DE8-	8B	4C	CE	8D	60	A0	00	2C
8950-	8A	8D	FA	03	A2	F8	86	08	8DFO-	AO	01	84	FE	20	A5	8C	A5
8958-	20	67	8A	A9	D0	20	CO	DE	8DF8-	FA	C5	FC	DO	06	A5	FB	C5
8960-	C9	80	90	5E	C9	C6	DO	36	8E00-	FD	F0	07	A0	80	84	D7	20
8968-	AO	18	20	2D	8A	20	67	8A	8E08-	CC	8A	A2	01	B5	1E	95	9B
8970-	4C	OD	8A	A2	06	B5	F3	48	8E10-	95	F8	95	FA	95	F6	CA	10
8978-	CA	DO	FA	A5	D8	48	86	D8	8E18-	F3	A9	06	A0	F1	20	F9	EA
8980-	20	44	89	20	B7	00	DO	5C	8E20-	A6	9B	A4	9C	20	2B	EB	A5
8988-	C9	00	DO	OC	68	85	D8	A2	8E28-	F5	85	1D	38	A5	F5	E5	1D
8990-	FA	68	95	FA	E8	DO	FA	60	8E30-	85	A5	C6	1D	DO	32	AO	01
8998-	20	B1	00	4C	80	89	AO	15	8E38-	84	FF	A4	F5	88	84	1D	C6
89A0-	C9	C9	F0	C6	C9	D2	90	3C	8E40-	1D	F0	A9	38	A5	FA	E5	06
89A8-	C9	E3	B0	38	29	7F	OA	A8	8E48-	85	FA	A5	FB	E5	07	85	FB
89B0-	20	B1	00	B9	DC	CF	8D	F9	8E50-	A5	F8	E9	05	85	F8	B0	02
89B8-	03	B9	DD	CF	8D	FA	03	4C	8E58-	C6	F9	20	89	8F	AO	01	A9
89C0-	04	8A	A2	FF	86	D7	E6	D7	8E60-	00	91	FA	88	91	FA	FO	D7
89C8-	AO	FF	38	C8	8B	BD	13	89	8E68-	A2	F8	20	48	8B	A2	FA	20
89D0-	F1	B8	F0	F7	E9	80	FO	OF	8E70-	36	8B	A2	F6	20	36	8B	20
89D8-	BD	13	89	FO	35	C9	80	B0	8E78-	48	8B	A4	1D	88	FO	1E	AO
89E0-	E5	E8	90	F4	4C	C9	DE	98	8E80-	41	20	C5	8B	AO	01	38	B9
89E8-	A2	B8	20	4A	8B	A5	D7	FO	8E88-	08	00	AA	65	1D	E5	F5	FO
89F0-	68	OA	AA	68	68	BD	2D	89	8E90-	01	8A	91	FA	88	10	EF	C8
89F8-	48	BD	2E	89	48	20	B1	00	8E98-	84	FF	20	89	8F	A5	9B	A4
8A00-	EO	05	90	55	20	BB	DE	20	8EAO-	9C	20	F9	EA	A5	F6	A4	F7
8A08-	67	8A	20	B8	DE	A2	80	86	8EA8-	20	7F	E9	A6	9B	A4	9C	20
8A10-	D7	60	20	67	8A	FO	F6	C9	8EB0-	2B	EB	05	FE	FO	8B	A5	F6
8A18-	2E	DO	26	68	68	A9	8C	48	8EB8-	A4	F7	20	F9	EA	A9	06	A0
8A20-	A9	6F	48	20	B1	00	20	67	8ECO-	F1	20	66	EA	A6	F6	A4	F7
8A28-	8A	A2	01	DO	E2	18	B9	B3	8EC8-	20	2B	EB	A2	FF	38	A5	FA
8A30-	DO	69	01	8D	F9	03	B9	B4	8ED0-	A4	FB	20	48	8F	A5	F5	85
8A38-	DO	69	00	8D	FA	03	4C	B1	8ED8-	09	A6	9B	A4	9C	86	1B	84
8A40-	00	38	E9	C8	C9	07	BO	9C	8EE0-	1C	A6	F8	A4	F9	86	17	84
8A48-	85	D7	OA	65	D7	A8	20	2D	8EE8-	18	A2	1B	20	36	8B	A2	17
8A50-	8A	C9	28	DO	D1	A9	40	85	8EFO-	20	36	8B	C6	09	FO	45	A4
8A58-	D7	20	67	DD	A2	3F	86	FE	8EF8-	09	C4	1D	FO	EC	A5	F5	85
8A60-	AO	89	84	FF	4C	2B	EB	A9	8F00-	08	A6	FA	FO	FB	86	19	84
8A68-	40	85	14	20	E3	DF	A6	08	8F08-	1A	A2	1E	20	48	8B	A2	19
8A70-	A5	12	05	11	FO	03	4C	76	8F10-	20	48	8B	C6	08	FO	D7	A4
8A78-	DD	85	14	AO	04	A9	02	D1	8F18-	08	C4	1D	FO	EC	A5	19	A4
8A80-	9B	DO	46	08	B1	9B	DO	41	8F20-	1A	20	F9	EA	A5	17	A4	18
8A88-	CB	B1	9B	C9	02	90	3A	95	8F28-	20	7F	E9	A5	1B	A4	1C	20
8A90-	FC	E8	C8	CO	09	DO	ED	98	8F30-	BE	E7	A6	1B	A4	1C	20	2B
8A98-	86	08	A2	9B	20	4A	8B	A6	8F38-	EE	4C	09	8F	A2	00	A5	F8
8AA0-	08	95	00	A5	9C	95	01	B5	8F40-	AC	F9	20	48	8F	4C	2B	8E
8AA8-	FB	A2	CE	20	54	8B	A6	08	8F48-	86	FF	85	19	84	1A	20	62
8AB0-	AO	CE	20	38	8B	EO	FA	DO	8F50-	8B	A6	F5	86	08	A2	19	AO
8AB8-	OD	A2	01	B5	CE	95	06	B5	8F58-	FC	20	38	8B	C6	08	FO	28
8AC0-	9B	95	1E	CA	10	F5	4C	B7	8F60-	A4	08	C4	1D	FO	EF	A5	19
8AC8-	00	4C	96	E1	A5	D7	FO	10	8F68-	A4	1A	20	F9	EA	A5	F6	A4
8AD0-	A2	01	4A	90	02	A2	03	B5	8F70-	F7	20	7F	E9	A5	9D	FO	06
8AD8-	F4	D5	F6	DO	EC	CA	10	F7	8F78-	A5	A2	45	FF	85	A2	A6	19
8AE0-	A2	05	B5	FA	95	17	CA	10	8F80-	A4	1A	20	2B	EB	4C	55	8F
8AE8-	F9	A5	F4	85	09	C6	09	FO	8F88-	60	AO	02	84	9F	C6	9F	30
8AF0-	56	A5	F5	85	08	A2	17	20	8F90-	F7	A5	9F	AB	45	FF	6A	B1
8AF8-	48	8E	A5	D7	FO	25	24	D7	8F98-	FA	FO	F2	20	62	8B	90	07
8B00-	70	07	30	OC	A2	1B	20	48	8FA0-	A8	A9	FA	A2	00	FO	05	AA
8B08-	8B	A5	1B	A4	1C	20	F9	EA	8FA8-	A9	F8	AO	00	48	20	75	8B
8B10-	A2	19	20	48	8B	A5	19	A4	8FB0-	68	AA	B5	00	85	CE	B5	01
8B18-	1A	20	E3	E9	24	D7	10	03	8FB8-	85	CF	A6	FF	FO	OD	B5	CE
8B20-	20	53	EB	C6	08	FO	C6	A5	8FC0-	4B	B5	1E	95	CE	68	95	1E
8B28-	9D	20	F8	03	A6	17	A4	18	8FC8-	CA	10	F3	A4	F5	88	84	9D
8B30-	20	2B	EB	4C	F5	8A	AO	06	8FD0-	AO	FC	A2	1E	20	38	8B	A2
8B38-	18	B5	00	79	00	00	95	00	8FD8-	CE	20	38	8B	AO	04	B1	1E
8B40-	B5	01	79	01	00	95	01	60	8FE0-	48	B1	CE	CO	01	DO	02	49
									8FE8-	80	91	1E	68	91	CE	88	10
									8FF0-	ED	C6	9D	DO	DB	FO	96	FF
									8FF8-	FF	FF	FF	FF	FF	FF	FF	FF
8B48-	A9	05	18	75	00	95	00	90									
8B50-	02	F6	01	60	95	00	AO	00									
8B58-	94	01	OA	36	01	OA	36	01									
8B60-	90	E9	90	08	AO	05	84	FC									
8B68-	AO	00	FO	06	A4	06	84	FC									
8B70-	A4	07	84	FD	60	8A	48	84									
8B78-	AD	AO	00	84	AE	A4	06	84									
8B80-	64	A5	07	20	B6	E2	18	8A									
8B88-	65	9B	85	1E	98	65	9C	85									
8B90-	1F	68	A2	A8	20	54	8B	A2									
8B98-	1E	AO	A8	DO	9B	AO	80	2C									
8BA0-	AE	00	2C	AO	40	A2	00	86									
8BA8-	A5	A5	F6	C5	F5	DO	5C	A6									
8BB0-	F4	E0	02	DO	56	CA	B5	F6									
8BB8-	95	F4	E5	FA	95	17	B5	CE									
8BC0-	95	06	CA	10	F1	84	D7	A4									
8BC8-	A5	84	F7	C8	A2	00	20	75									
8BD0-	8E	A2	A8	A5	A5	20	54	8B									
8BD8-	4C	E7	8B	A5	D7	4A	BO	17									
8BE0-	A6	17	A4	18	20	2B	EB	A2									
8BE8-	17	20	48	8B	A9	FF	20	40									
8BF0-	EC	85	9D	45	D7	85	A2	E6									
8BF8-	A7	A5	A7	C5	F4	90	23	A5									
8C00-	D7	4A	90	OA	60	A5	F4	C5									
8C08-	F5	F0	F9	4C	96	E1	4A	BO									
8C10-	F3	A2	01	E6	D7	B5	FA	95									
8C18-	1E	95	17	CA	10	F5	A5	F4									



## A STATISTICAL ANALYSIS AND FILE MAINTENANCE SYSTEM FOR THE APPLE II™ MICROCOMPUTER

As a Subset Language of P-STAT™ 78...

A-STAT™ 79 computes:

FREQUENCIES  
BI-VARIATE TABLES · CHI SQUARES  
CORRELATION MATRICES  
MULTIPLE REGRESSION  
RESIDUALS  
APPLE PLOT INTERFACE  
APPLE FILE CABINET INTERFACE  
FILE SORT  
AGGREGATION  
REPORT WRITING  
COMPLETE TRANSFORMATION LANGUAGE  
READS VISICALC FILES

A-STAT™ 79

Uses Standard DOS Text File and EXEC's  
48K Version — All programs in Applesoft™

A-STAT™ 79 is available from:

ROSEN GRANDON ASSOCIATES

7807 Whittier Street

Tampa, Florida 33617

(813) 985-4911

A-STAT™ 79 on disk with 80-page manual... \$145.00

Apple II™ is a trademark of the Apple Computer Inc.  
P-STAT™ 78 is a trademark of P-STAT Inc., Princeton, N.J.  
A-STAT™ 79 is copyrighted by Gary M. Giendow, Ph.D.

## OSI COMPATIBLE HARDWARE

- IO-CA10X SERIAL PORT** \$125  
ACIA based RS-232 serial printer port. DIP SWITCH selectable baud rates of 300-9600. Handshaking (CTS) input line is provided to signal the computer when the printer buffer is full. Compatible with OS-65U V1.2 and OS-65D.
- IO-CA9 PARALLEL PORT** \$175  
Centronics Standard Parallel printer interface for OSI computers. The card comes complete with 10 ft. of flat ribbon cable. Compatible with OS-65D and OS-65U software.
- IO-CA9D DIABLO PARALLEL PORT** \$175  
DIABLO 12 BIT WORD Parallel port for use with word processor type printers. Complete with 10 ft. cable. Compatible with OS-65U software.
- IO-LEVEL 3 MULTI-USER EXPANSION** \$450  
Provides 3 printer interfaces currently supported by OSI-Series, Centronics Parallel, Olsblo Parallel. 4K of memory at D000 for Multi-user executive. 4 Port serial cluster. The LEVEL 3 card allows expansion of an OSI C3 machine up to 4 users with appropriate additional memory partitions.
- 24MEM-CM9... \$390**      **16MEM-CM9... \$300**      **8MEM-CM9... \$210**  
24K memory card is available at 3 different populated levels. All cards are fully socketed for 24K of memory. The card uses 2114-300ns chips. DIP SWITCH addressing is provided in the form of one 16K block and one 8K block. Also supports DIP SWITCH memory partition addressing for use in multi-user systems.
- FL470 FLOPPY DISK CONTROLLER** \$180  
OSI-type floppy disk controller and real time clock. Will Support 5 1/4" or 8". Single or double-sided drives. Requires drives with separated data and clock outputs.
- 810-1600 BARE I/O CARD** \$50  
Super I/O Card. Supports 8K of 2114 memory in two DIP SWITCH addressable 4K blocks. 216 Bit Parallel Ports may be used as printer interfaces. 5 RS-232 Serial Ports with CTS & RTS handshaking. With manual and Molex connectors.
- 8MEM-CM9 BARE MEMORY CARD** \$50  
Bare 24K memory card, also supports OSI-type real time clock and floppy disk controller. With manual and Molex connectors.
- 406 PROTOTYPE CARD** \$35  
Prototype board holds 96 14 or 16 pin IC's. Will also accommodate 18, 24, or 40 pin IC's. Row and column zone markings, easy layout. 1/2" epoxy glass P.C. board.
- C1P-EXPANSION INTERFACE** \$85  
Expansion for C1P800 or 610 boards to the OSI 48 Pin Buss. Uses expansion socket and interface circuitry to expand to 48 Pin Backplane. Requires one slot in backplane.
- BP-500 BACKPLANE** \$47  
Assembled 8-slot backplane with male Molex connectors and termination resistors.
- DSK-SW DISK SWITCH** \$29  
A circuit when added to OSI Minifloppy systems extends the life of drives and media. Accomplish this by shutting off Minifloppy Spindle motor when system is not accessing the drive. Complete KIT and manual.
- PW-5-6 POWER SUPPLY** \$29  
Power One brand supply 5V - 6 amps with overvoltage protection. Reg. \$49.95.

## D&N MICRO PRODUCTS, INC.

3684 N. Wells Street Ft. Wayne, Indiana 46808

219/485-6414

TERMS: Check or money order Add \$2 Shipping. Outside U.S. add 10%.

# Olympic Sales Company

SERVING YOU SINCE 1947

Main Showroom & Offices:  
216 South Oxford Avenue  
Los Angeles, CA 90004

WE WORK  
VISA and MASTERCARD

TELEX: 67 34 77

ORDER DESKS open 7 Days a Week!

7:00 AM to 7:00 PM Mon thru Sat

Sunday Noon to 5:00 PM

Order Desks: (213) 739-1130

TOLL-FREE TOLL-FREE

(outside Calif.) (within Calif.)

800-421-8045 800-252-2153

NO ONE UNDERSELLS OLYMPIC SALES

Write & request our new 112 pg catalog—please include \$1.00 to defray postage & handling—includes many more items from TV's to Watches!

All goods subject to availability; this ad supersedes all previous ads; we are not responsible for typographical errors; we will meet or beat any advertised prices if the competition has the goods on hand.  
Minimum shipping and handling \$4.95.  
All orders subject to verification and acceptance.



We are an authorized servicing Apple dealer for Apple II & III. Immediate delivery on II models—we carry a tremendous inventory of Apple products in stock!



Large inventory of:  
Disk with controller GDS 3.3  
Second Disk Drives  
Pascal—Catalan—Catalan languages  
Bowie Jones & Quate reporter  
Graphics II Plus  
Visicalc for Apple II & III  
Microsystem II by DC Hayes  
and more...

Immediate delivery  
NEW, IMPROVED APPLE III 128K VERSION  
ATTENTION: Immediate delivery  
WE ALSO CARRY SOFTWARE:  
Personal Software  
Peach Tree Software  
Microsoft  
Microsoft  
American  
System Plus  
and more...

NOW  
IN STOCK!

## HP HEWLETT PACKARD

2 NEW DELUXE CALCULATORS FROM HP!  
Slim, shift-pocket styling

NEW! HP-11C Your Cost: \$114.95  
Advanced Programmable Scientific LCD Retail \$130.00

NEW! HP-12C Your Cost: \$129.95  
Advanced Programmable Financial LCD Retail \$150.00

HP-125 New Microcomputer  
64K CPU/Terminal/Keyboard  
Retail Your Cost  
\$750.00 \$305.00

HP-85 Microcomputer—built-in printer/monitor  
Retail Your Cost  
\$250.00 \$299.00

HP-83 Microcomputer—built-in monitor  
Retail Your Cost  
\$250.00 \$299.00

HP-2631 Printer, dot matrix (ask for options)  
Retail Your Cost  
\$495.00 \$55.00

HP-2601 A Letter quality printer, dot matrix  
Retail Your Cost  
\$495.00 \$55.00

HP-8201M Disk master (250KB disk drive) \$500.00  
Call us for the lowest prices on 7 disk drives! Call us!

HP 41CV New 2.2K Bytes of memory  
Card Reader for 41CV  
Retail Your Cost  
\$215.00 \$171.00

HP 41C Printer for 41CV  
Retail Your Cost  
\$395.00 \$204.00

Guard Ram  
Retail Your Cost  
\$95.00 \$4.05

Optical Wed for 41CV  
Retail Your Cost  
\$125.00 \$0.05

HP 41C Calculator  
Memory mod. for 41C  
Retail Your Cost  
\$250.00 \$20.95

HP 24C Programmable  
Retail Your Cost  
\$750.00 \$70.05

HP 38C Programmable Business R/E  
Retail Your Cost  
\$150.00 \$119.05

We have the complete line of accessories, etc.

## Texas Instruments

Home Computer

New—182Z Model with  
full typewriter-style keyboard  
Retail Your Cost  
\$369.95 \$350.00

New KEYBOARD  
Retail Your Cost  
\$50.00 \$38.00

16" color monitor for 182Z  
32K Exp. mem. mod. \$110.00  
Extended 512K 1MUST 101  
32K mod. \$75.00

We carry a large inventory of software, & accessories.  
Retail Your Cost

T1-302 LCS Sio Slide NEW 18.95

T1-353P LCD SCIENTIFIC 22.50

T1-40 LCD Sci/NEW 28.95

T1-67 Prog. Scientific 39.95

T1-58C 480 Step. Prog. 89.95

T1-59 360 Step. Prog. 179.95

PC-100C Print/Plot 149.95

LCD-Programmer/NEW 59.95

Large inventory of peripherals, etc., etc.

ATARI Computer  
490 SPECIAL PRICE! 15K  
No in-house inc., opt'l basic.  
Retail Your Cost  
\$95.00 \$30.05

100 16K Computers 1080.00 750.05

SPECIAL!  
ATARI 800 48K Computer 1250.00 869.95

## PRINTERS

• DIABLO (Letter Quality) Retail Your Cost

630 R102 bi-directional tractor 2965.00 2699.00

1640K109 keyboard, tractor 3072.00 2899.95

630 R0 Receive only 2710.00 2499.95

1650K136 keyboard/tractor 3220.00 2999.95

• CENTRONICS dot matrix

700 8 Parallel, heavy duty 1460.00 1199.95

704 9 Serial, heavy duty 1795.00 1599.95

737 1 Parallel 995.00 799.95

737 3 Serial 1045.00 899.95

704 11 Parallel 1870.00 1695.00

P1 Electrostatic 495.00 189.95

• PAPER TIGER

460 005.00 005.00

4600 pin phos 1094.00 080.95

589 1205.00 1000.00

5800 graphics 1384.00 1105.00

445 705.00 005.00

445G 894.00 780.00

EPSON PRINTERS Retail Your Cost

Optional Graftax Chip 80 95.00

MX80 FT 745.00 589.95

MX80 + GRAFTAX 80 895.00 578.95

MX80 FT + GRAFTAX 80 795.00 589.95

MX80 995.00 789.95

## WE ALSO HAVE

• NOVATION Modems Retail Your Cost

CAT 199.95 159.95

D CAT 199.95 159.95

APPLE-CAT Direct connect 349.95 314.95

SANYO MONITORS High resolution

13" Color (new) high res only 550.00 419.05

12" Green phosphor only 360.00 259.05

12" Black & white 340.00 239.05

15" Black & white 370.00 259.95

9" Black & white (the best sell!) 235.00 109.95

AMDEK (Loedex) High Quality Monitors

100 12" 8W, 12 MHz 179.00 139.95

100 G 12" Green, 12 MHz 109.00 174.95

200 G 12" Green, 18 MHz 249.00 190.95

Color II 13" Color, NTSC comp. input, 449.00 330.95

Color II 13" Color, RGB input, 599.00 699.95

for exp. graphics, speaker

• HAZELTINE Video Display Terminals

• SHUGART Disk Drives

• DEC VT100 & VT103

Call us for your DISCOUNTED price TODAY!

Many other OSI products—at discounted prices

NEW! From T1-Series 10 Personal Information Terminal Retail 995.00 Your Cost 795.00

# MICRO

## Software Catalog

**Name:** CONST  
**System:** North Star and Apple  
**Memory:** 32K minimum  
**Language:** BASIC  
**Description:** This program was written to do quantity and sizing take-offs for residential and small commercial structures. To operate the program, the user has only to answer questions concerning room sizes and type of construction.

**Price:** \$75.00; listing \$60.  
 Includes diskette, on-line documentation, support.

**Author:** David Lovejoy  
**Available:** Computing Interface  
 1918 Carnegie Lane #C  
 Redondo Beach, CA  
 90278

**Name:** BITPAK (for teachers)  
**System:** Apple II  
**Memory:** 48K  
**Language:** Applesoft  
**Hardware:** DOS 3.3/3.2; printer option

**Description:** Consists of super decimals, long division with remainders, and Super Etch-A-Sketch. The first two are serious CAI programs for grades 1-9. Will do operations with decimals or whole numbers, and long division with remainders. You select the size of the numbers, not levels. Grades work, has traps, and field tested. The third program will sketch designs on the Lo-Res screen with save-to-disk option. Keyboard version, change colors, erase, X-Y coordinates displayed.

**Price:** \$24.00  
**Author:** [IA]:Calabrese  
**Available:** Bit'N Pieces Series  
 P.O. Box 7035  
 Eire, PA 16510

**Name:** Net-Works  
**System:** Apple II or Apple II Plus  
**Memory:** 48K  
**Hardware:** 1 drive, DOS 3.3, Applesoft in ROM, D.C. Hayes Micromodem

**Description:** Bulletin board and computerized message system for Apple II. Features speedy log-on, electronic mail with security provisions, downloading programs, editing, much more. May be used in conjunction with Computer Station's "Auto Modem" for establishing a business communication network, office to home message system,

bulletin board service, etc. System operator has complete control of who uses the system.

**Price:** \$124.95 includes disk plus full documentation in sturdy 3-ring binder  
**Available:** Computer Station  
 11610 Page Service Dr.  
 St. Louis MO 63141  
 (314) 432-7019

**Name:** The Normalcy Life Dynamic

**System:** Apple II  
**Memory:** 48K  
**Language:** Applesoft, Machine  
**Hardware:** Apple II Plus, Disk II  
**Description:** Do you think you want to be "normal"? Perhaps you don't! You'll see, after playing the games on this disk. In fact, your whole perception of normality may change. This disk includes such games as *The Mine Fields of Normalcy*, *Depth Charge!*, *Mystery Code*, and *Deep Sea Treasure*, totally unique games that challenge beliefs as well as skills. Some of the best sound effects ever heard, Hi-Res.

**Price:** \$15.95 includes disk, game card  
**Available:** Avant-Garde Creations  
 P.O. Box 30161  
 Dept. MCC  
 Eugene, OR 97403

**Name:** Applied Educational Systems Grade Reporting System

**System:** Apple II Plus using Microsoft Softcard  
**Memory:** 48K  
**Language:** Microsoft BASIC-80 with CP/M operating system  
**Hardware:** Apple II, Radio Shack Models I, II, and III and PET

**Description:** The AES Grade Reporting System produces professional, full-sized report cards for schools of up to 2500 students, and provides the following summary reports: honor rolls; rank in class listings; GPA listing; summary attendance list; class lists; failure and incomplete list; frequency distribution of grades by teacher, course, student year, and department; homeroom lists; permanent record labels; and mailing labels. The system is menu driven and uses a low-cost, automatic mark sense

card reader for data entry.

**Price:** \$2000 includes installation, one-day training session, operating manual  
**Author:** Robert C. Hamilton  
**Available:** Applied Educational Systems  
 RFD 2, Box 213  
 Dunbarton, NH 03301

**Name:** VISI-CAIDS

**System:** Apple II  
**Memory:** 32K  
**Language:** Applesoft  
**Hardware:** Printer, 1 or 2 disk drives

**Description:** VISI-CAIDS is a companion package of formatting aids for use with VisiCalc™ text files. The "Label Splitter" creates a new text file, compatible with VisiCalc™, which divides wide label entries in a selected column into two or more narrower columns. The "Width Adjuster" prints VisiCalc™ data into variable width columns and can simulate a split screen on the printer. Also includes "Formula Reader" with special features and a "Print File Reader."

**Price:** \$34.95 includes one disk plus instructions

**Author:** Charles Harrison  
**Available:** Data Security Concepts  
 P.O. Box 31044  
 DesPeres, MO 63131  
 (314) 965-5044

**Name:** Space Adventure Pak

**System:** Atari 400/800  
**Memory:** 16K cassette  
 24K disk

**Language:** BASIC  
**Hardware:** Joysticks and paddles  
**Description:** Space Adventure is an arcade game package that includes two action graphics and sound programs for the Atari. "Space Wars" is a high speed space battle between you and your Atari. "Shootout" is a cannon fight between you and your opponent. Uses player/missile graphics ability of your Atari computer system. Other software is available. Write for complete list.

**Price:** \$12.95 cassette ppd  
 \$15.95 disk ppd  
**Author:** Russell A. Grockett, Jr.  
**Available:** Kinetic Designs  
 401 Monument Rd. #171  
 Jacksonville, FL 32211

**Name:** CHAT

**System:** Apple II or Apple II Plus  
**Memory:** 48K  
**Language:** Applesoft in ROM or Language Card  
**Hardware:** Hayes Micromodem, Disk II, printer optional

## Software Catalog (continued)

**Description:** CHAT is the communications package that offers you the freedom and fun of simple conversation. Save incoming data in a large 26K buffer. Edit, print, or store on disk what you save. Use the input anything line editor to create text files. Transfer or receive text files or BASIC programs to or from other computers. Features are: automatic log-on to networks, simple configuring to your system, character filter, non-keyboard characters, answering the phone — all clearly explained.

**Price:** \$40.00 includes manual, four Applesoft programs, three text files and CHAT binary code on a diskette, DOS 3.3

**Author:** Robert W. Lovell

**Available:** Lovell's  
4205 Biltmore  
Corpus Christi, TX  
78413  
(512) 852-3096

**Name:** OSI BASIC Enhancer

**System:** OSI C1P/  
Superboard/C4P

**Memory:** 8K

**Language:** Machine code w/BASIC-  
IN-ROM

**Hardware:** C1P, Superboard, C4P

**Description:** BASIC programmers who want real power over their awkward stock system will love this one. Get real delete action, replace cursor with one of your own choice (defaults to checkerboard square), commands to RENUMBER your programs to make them easy to read, AUTOSEQUENCER will save you from typing in line numbers, screen control to stop scrolling I key to running BASIC. LOAD and SAVE files with filenames on a token I/O system to reduce load-save times by 50%. Runs in approximately 1.5K of RAM. Send \$1.00 for complete catalog.

**Price:** \$19.95 postpaid includes autoloader, autorun cassette only, User's Manual and bug-free guarantee

**Author:** Timothy W. Jackson

**Available:** Computer Science  
Engineering  
57 Beals St. Rm. 57-12  
Brookline, MA 02146

**Name:** Notewriter

**System:** Apple II Plus

**Memory:** 48K

**Language:** Assembly, Applesoft

**Hardware:** Soundchaser 3 Voice

Synthesizer Card, Soundchaser Music Keyboard and Interface Card

**Description:** Notewriter is a unique program that transcribes music played live on the Music Keyboard to the monitor screen in real time. The score can then be edited in its entirety and printed out on a graphics printer. A click track is used to sync the music entry with the music notation to give accurate rhythmic representation.

**Price:** \$100.00 includes software and documentation

**Available:** Passport Designs, Inc.  
785 Main Street, Suite E  
Half Moon Bay, CA  
94019

**Name:** Falcons

**System:** Apple II and Apple III

**Memory:** 48K

**Language:** BASIC

**Hardware:** Apple II, Apple II Plus, Apple III

**Description:** Invaders-style game with five levels of invading forces to be repelled. Very challenging and fast-paced. Succeeding games, if you get through a complete game, are more difficult.

## OSI Disk Users

### Double your disk storage capacity Without adding disk drives

Now you can more than double your usable floppy disk storage capacity—for a fraction of the cost of additional disk drives. Modular Systems' DiskDoubler™ is a double-density adapter that doubles the storage capacity of each disk track. The DiskDoubler plugs directly into an OSI disk interface board. No changes to hardware or software are required.

The DiskDoubler increases free user disk space from 50K to 120K for mini-floppies, from 201K to 420K for 8-inch floppies. With the DiskDoubler, each drive does the work of two. You can have more and larger programs, related files, and disk utilities on the same disk—for easier operation without constant disk changes.

Your OSI system is an investment in computing power. Get the full value from the disk hardware and software that you already own. Just write to us, and we'll send you the full story on the DiskDoubler, along with the rest of our growing family of OSI-compatible products.

™ DiskDoubler is a trademark of Modular Systems

## Modular Systems

P.O. Box 16A Oradell, NJ 07649  
201-262-0093

Computer  
Case  
Company

comp  
case



• AP103

• AP101	Apple II with Single Disk Drive .....	\$109
• AP102	Apple II with Double Disk Drives .....	119
• AP103	Apple II, 9 inch Monitor & Double Drives ..	129
• AP104	Apple III, two additional Drives & Silentype	139
• AP105	12 inch monitor plus accessories .....	99
• RS201	TRS-80 Model I, Expansion Unit & Drives ..	109
• RS202	TRS-80 Monitor or TV set .....	84
• RS204	TRS-80 Model III .....	129
• RS205	Radio Shack Color Computer .....	89
• AT301	Atari Computer & Accessories .....	109
• P401	Paper Tiger 440/445/460 .....	99
• P402	Centronics 730/737 Line Printer II/IV .....	89
• P403	Epson MX70 or MX80 .....	89
• P404	Epson MX100 .....	99
• CC90	Matching Attache Case .....	75

computer case company

5650 INDIAN MOUND CT. COLUMBUS, OHIO 43213 (614) 868-9464

## Software Catalog (continued)

Price: \$29.95  
Author: Eric Varsanyi and  
Thomas Ball  
Available: Piceadilly Software Inc.  
89 Summit Ave.  
Summit, NJ 07901  
(201) 277-1020

Name: **Kamakaze Education Pack**  
System: OSI C1P  
Memory: 8K  
Language: BASIC  
Description: Four educational programs in one. Send your men on a tank destroying mission by correctly answering a question from Spelling Drill, Addition Drill, Multiplication Drill, or Place Value Drill.  
Price: \$15.00  
Author: Henry Svec  
Available: Henry Svec  
668 Sherene Terrace  
London, Ontario  
Canada N6H 3K1

Name: **Type**  
System: SDOS or SDOS/MT  
Memory: 48K minimum  
Hardware: 6800/6809 CPU with CRT, disk and printer

Description: *Type* is a document-formatting program, used in word processing or document production. Commands embedded in raw text files processed by *TYPE* control the formatting of that text on the output device. Output formatting includes full justification, page width and depth, page numbering, centering, spacing, titles and table of contents generation. *Type* is used in conjunction with the SD Screen Editor for easy data entry.

Price: \$140.00 includes *Type* Program, 100-page manual

Author: AMS  
Available: Software Dynamics,  
(exclusively)  
211 W. Crescent Suite G  
Anaheim, CA 92801  
(714) 635-4761

Name: **Soft Pretzels for OSI**  
System: All OSI cassette-based systems  
Memory: 8K  
Language: OSI BASIC  
Hardware: Standard systems (cassette only!)

Description: High speed, real time, action arcade games including "Humanoid Defender," "Lunar Rescuer," "Rebel Gunner," "Spiderfood," "Rampaging Robots" and many more! All include color and sound at no extra cost. Sound for C1P is fully supported! Instruction sheet for installing sound on C1P available. Educational programs also available.

Price: \$1.00 for photo-illustrated catalog, includes \$1.50 credit on first order. Color and sound for C4Ps, sound for all C1Ps.

Author: Boh Retelle, et. al.  
Available: Pretzelland Software  
2005 Whittaker Rd.  
Ypsilanti, MI 48197

**MICRO**

# 6502

# FORTH

- adheres to the FORTH-79 STANDARD
- performs FLOATING POINT MATH
- contains a 6502 MACRO ASSEMBLER
- handles STRINGS much like BASIC
- Includes VIRTUAL MEMORY MANAGER
- is ROMABLE
- costs under \$100
- is available for KIM-1, AIM 65 and SYM-1
- comes with complete SOURCE LISTING
- manual has extensive FORTH TUTORIAL

### For more information and an ordering form

contact: Eric C. Rehnke  
1067 Jadestone Lane  
Corona, CA 91720  
(714) 371-4548

### Engineering Micro-Software Center Design Software for Micro-Computers Apple II & III

Vibration Analysis  
Structural Loads and Stress  
General Mechanical Design

104 E. Queenwood, Suite 2  
Morton, Illinois 61550  
309-263/2602

### Software for Engineers by Engineers

- |  |       |
|--|-------|
| I. Truss & Linkage Analysis 2D & 3D                  | \$75  |
| II. Beam Analysis w/Multi-Loads (diagrams)           | \$75  |
| III. Rubber Element Design Shear & Compression       | \$75  |
| IV. Torsional System Vibration                       | \$100 |
| Holzer Analysis (Branching & Gearing)                |       |
| V. Linear Vibration Systems-6 Degree of Freedom Mass | \$75  |
| Excellent for Mounting System Response               |       |
| VI. Bolted Joint Analysis                            | \$50  |
| VII. Fourier Analysis w/Data Display                 | \$35  |
| VIII. Column Design/Minimum Moment of Inertia Calc   | \$60  |
| IX. Four-Bar Linkage — Generates Coupler Point Path  | \$60  |
| Motion Synthesis for Mechanisms                      |       |
| X. Weibull Failure Analysis — Considers both         | \$60  |
| Failures and Suspensions w/Printer Plot              |       |
| XI. CPM-Critical Path Method of Project Management   | \$60  |
| Very General — 500 Activities Max                    |       |

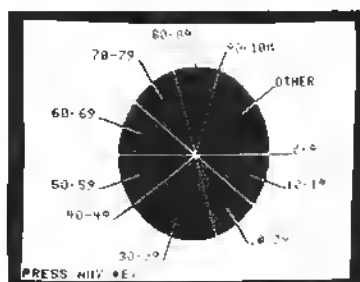
*All Software is Well Prompted  
Many Others Under Development Now  
by our Professional Staff*

GET 120% VALUE FOR YOUR  
PROGRAM PURCHASING DOLLAR  
WITH

# THE DATA REPORTER

MORE THAN JUST A DATABASE

Version 2 of the versatile Modifiable Database



## DATA PLOT & ANALYSIS

- Data may be plotted in a variety of formats such as scatter graphs, line graphs, bar charts, and pie charts.
- Ranges, minimums, maximums, means, standard deviations, correlation coefficients, etc. of any number of data files can be calculated

## PLOTTER PACKAGE

## TEXT EDITOR

## THE DATABASE

20% 40%  
20% 40%

## INFORMATION MANAGEMENT

## POWERFUL DATA MANAGER

- Versatile, user definable database can store data segmented by up to 35 fields.
- User oriented format is easy for the novice or professional to utilize. The use of menus, extensive prompting, single keystroke commands, and a universal escape capability allow anyone to store or retrieve information in seconds without errors.
- Machine language searches and sorts operate in a fraction of the time required by other programs.
- Searches or sorts, subtotals or totals may be performed on any field at any time, not just on those that are indexed or specified in advance.
- Search results may be displayed, printed, deleted, counted, totalled, edited, and/or saved to a new data file.

## REPORT GENERATOR

## OTHER FEATURES



- The sophisticated report generator allows you to format your data output in an infinite variety of ways.
- You can print form letters, columnar reports, lists, mailing labels, etc.
- Data, ratios or the results of calculations can be embedded anywhere in your letters or reports.
- The report generator gives your output the professional appearance that you require.

- HARD DISK DRIVE COMPATIBILITY** with hard drive version, works with Corvus and other hard drives.
- Works with all Floppy drives with slot, drive and volume selection.
- You can append or merge up to a full disk of data files, or segment your data into separate files by a search key.
- Searches can contain up to 10 levels. You can search for a key word in any field, the absence of a keyword, or a number being within a specified range.
- Global editing of data may be performed.
- Arithmetic processing can be performed during record entry, edit, or output.
- Record entry, edit, or deletion (individual records or blocks) can be performed with no tedious delays waiting for disk accesses, index file updates, etc.
- Data may be stored on any number of floppy or hard disk drives.
- Data files can be reformatted at any time without reentering the data.
- With \$5.00 Registration Fee receive one backup disk.
- The package requires an Apple II plus or Apple II with Applesoft firmware, 48K RAM, at least one disk drive, and DOS 3.3.

# SYNERGISTIC SOFTWARE

ORDER YOURS TODAY!

Floppy Drive version \$220.00 — Hard Drive version \$220.00

Available from your local dealer or send check or money order to Synergistic Software, 5221 120 Avenue S.E., Bellevue, Washington 98006 or phone 206-226-3216.

Washington residents add 5.4% sales tax.  
Apple is a trademark of Apple Computer, Inc.



# NEW!

## SYM-1/KTM-2 Enclosure



### ENCLOSURE FEATURES:

- Low Profile Design: 18.5 in. Wide x 16 in. Deep x 4.5 in. High
- .060 Aluminum • Durable Charcoal Texture Finish • Walnut Finished Side Panels • Hinged Top • Rear Panel, Power & I/O • Simple Assembly & Instructions

### ENCLOSURE INCLUDES:

- Keypad Access Cover • Rubber Feet • Fuse and Fuse Holder • Power On Switch • Terminal Strip • AC Outlet

612-633-3035

**KEN-WAY PRODUCTS**



### MOUNTING PROVISIONS FOR:

- SYM-1/KTM-2 • Add-on Memory Board • Cooling Fan • (2) DB25 Connectors (RS 232) • Video Jack

**\$95.00** lab Minneapolis

831 Patton Rd., New Brighton, Minnesota 55112

## PROGRAMMER

PROGRAMMER is a newsletter that offers tips on software technique and invaluable marketing information.

You'll learn who is selling software and who isn't.

What markets are hot and what markets are dead.

Industry features keep you informed about your rights as a freelancer.

**PRE-PUBLICATION  
CHARTER PRICE  
6 MONTHS  
JUST \$13.00**

Don't be without it!

SEND CHECK OR MONEY ORDER TO: **PROGRAMMER**  
P.O. BOX 3210  
MANCHESTER, N.H. 03105

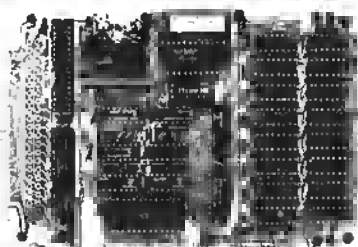
NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

CITY: \_\_\_\_\_ STATE: \_\_\_\_\_ ZIP: \_\_\_\_\_

☐ CHECK BOX FOR SAMPLE ISSUE—\$2.00

\*D-2



### BETA 32K BYTE EXPANDABLE RAM FOR 6502 AND 6800 SYSTEMS

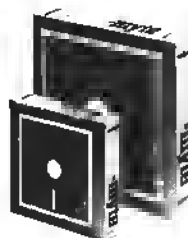
#### AIM 65 KIM SYM PET S44-BUS

- Plug compatible with the AIM-65/SYM expansion connector by using a right angle connector (supplied).
- Memory board edge connector plugs into the 6800 S44 bus.
- Connects to PET using an adapter cable.
- Uses +5V only, supplied from the host computer.
- Full documentation. Assembled and tested boards are guaranteed for one full year. Purchase price is fully refundable if board is returned undamaged within 14 days.

Assembled with 32K RAM.....\$349.00  
 & Tested with 16K RAM..... 329.00  
 Bare board, manual & hard-to-get parts... 99.00  
 PET interface kit. Connects the 32K RAM board to a 4K or 8K PET.....\$ 69.00

See our full-page ad in  
**BYTE and INTERFACE AGE**

**wabash**



8" or 5 1/4" flexible diskettes certified 100% error free with manufacturer's 5-year limited warranty on all 8" media. Soft-sectored in boxes of 10. 5 1/4" available in 10-sector.

(Add \$3.00 for plastic library cases)

8" single sided, single density.....\$27.50  
 8" single sided, double density..... 35.50  
 8" double sided, double density..... 45.50  
 5 1/4" single sided, single density..... 27.50  
 5 1/4" single sided, double density..... 29.50  
 5 1/4" single sided, double density, 10-sector \$29.50

**TERMS:** Minimum order \$15.00. Minimum shipping and handling \$3.00. Calif. residents add 6% sales tax. Cash, checks, Mastercard, Visa and purchase orders from qualified firms are accepted. (Please allow two weeks for personal checks to clear before shipment.) Product availability and pricing subject to change without notice.

**INTERNATIONAL ORDERS:** Add 15% to purchase price for all orders. Minimum shipping charge is \$20.00. Orders with insufficient funds will be delayed. Express funds will be returned with your order. All prices are U.S. only

## PAPER TIGER PRINTERS

IDS 460G 9x9 Dot Matrix Printer.....\$890.00  
 IDS 560G Wide Carriage Printer..... 1099.00

### TERMINALS

ADDS Viewpoint .....\$569.00  
 TeleVideo 910 ..... 579.00  
 TeleVideo 912C ..... 679.00  
 TeleVideo 920C ..... 729.00  
 TriteVideo 950 ..... 929.00

### 8" DISK DRIVES

Shugart 801R.....\$399.00  
 NEC FD1160 (double sided)..... 569.00

### DYNAMIC RAMS

4116 (200ns) ..... set of 8 .....\$24.00  
 4164 (64Kx1) ..... .....\$18.00

**BETA**  
COMPUTER DEVICES

1230 W. COLLINS AVE.  
ORANGE, CA 92668

(714) 633-7300



# MICRO

## Hardware Catalog

**Name: RS-232 DB-25 Pin  
Reconfiguration Adapter**

Description: Printed circuit card with one male and one female DB25 connector mounted on it and incorporating a special "matrix switch." This device enables users to instantly mate almost any serial I/O device to any computer by rerouting RS-232C signals.

Price: \$59.95

Available: Mountain Computer Inc.  
300 El Pueblo Rd.  
Scotts Valley, CA 95066  
(or local Apple dealers)

**Name: 16K RamBoard**

System: Apple II or Apple II Plus

Memory: 16K Dynamic RamBoard

Description: A 16K RamBoard that expands an Apple II or Apple II Plus 48K to 64K. The RamBoard is compatible with all Apple II languages and software. It enhances operations by allowing larger languages, data bases and programs. It also greatly improves the capability of CP/M, Pascal, Fortran and Cobol.

Price: \$129.95 introductory offer includes RamBoard and complete installation and operating instructions

Available: ConComp Industries  
8338 Center Drive  
La Mesa, CA 92041  
(714) 464-8715

**Name: MFD Mini-Disk Systems**

System: AIM 65, KIM, SYM

Language: DOS supports AIM monitor, Assembler, BASIC and PL/65

Hardware: Controller, Drive(s), Cable

Description: Mini-Disk storage system including DOS, drive controller, cable and user's manual for AIM 65, KIM and SYM computers. Controller available for either the AIM expansion bus or for the SS-50 bus. AIM-to-SS-50 motherboard adapter available.

Price: Mini-Disk Systems from \$599.95, Adapter (M-65/50) is \$89.95.

Available: Percom Data Co., Inc.  
11220 Pagemill Rd.  
Dallas, TX 75243  
(214) 340-7081  
(and authorized Percom dealers)

**Name: The DOS Switch**

System: Apple II, Apple II Plus

Description: Allows a DOS 3.3 equipped Apple II system to boot DOS 3.2 or DOS 3.3 diskettes simply by flipping The DOS Switch. You can conveniently use your valuable copy-protected/unMUFFINable DOS 3.2 software, without the BASICs diskette. Easy to install and use. Two models: DS-1 (uses your P5 and P5A PROMs), and DS-2 (3.2 boot PROM installed).

Price: Model DS-1 \$29.95

Model DS-2 \$44.95

Available: Computer Micro Works,  
Inc.

P.O. Box 33651

Dayton, Ohio 45433

(or Apple dealers)

**Name: Dithertizer II**

System: Apple II

Memory: 48K

Language: Applesoft and Assembler

Hardware: Board

Description: Package consists of board, Sanyo VC 1610X camera, and cables. Also included is software for image contouring. The Dithertizer converts input into dithered images which produce the appearance of gray scales on the Apple II screen. Pictures may be saved to disk and the number of scan levels may be increased.

Price: \$656.00 includes S&H

Available: Peripherals Plus  
39 E. Hanover Ave.  
Morris Plains, NJ 07950

**Name: GMS 6519 Floppy/Printer  
Controller**

System: 6500/6800

Hardware: 6" x 9.75" module

Description: Controls two 5 1/4" floppy disk drives and a printer, with eight programmable I/O lines, 1 MHz or 2 MHz operation, base address and enable/disable switches, over voltage and reverse polarity protection. Optional 4K operating system, optional 6K 6502 assembler, both compatible with System 6T. Can drive floppies such as Shugart, Teac, Pertec; printer such as Centronics.

Price: \$246.00, single piece qty.

Available: General Micro Systems  
1320 Chaffey Ct.  
Ontario, CA 91762  
(714) 621-7532

**Name: Andromeda ROM Board**

System: Apple II

Memory: Any

Description: The Andromeda ROM board permits you to plug many utility programs into your Apple II and access them instantly without loading them from disk. You can install 2K PROMs, 4K PROMs, or even 2K RAM chips in each of 2 memory sockets. Comes with a utility ROM with five built-in options to apply to your Applesoft programs: automatic line numbering, list control, DOS expunge, alphabetize disk catalog, and restore a crashed program. Many more PROMs are available.

Price: \$125.00

Available: Computer Data Services  
P.O. Box 696  
Amherst, NH 03031  
(603) 673-7375

**Name: The Index**

Microcomputer

Memory: BASIC configuration is 80K of RAM, expandable to 2 million characters

Language: Supports Business BASIC, Cobol, Fortran, Pascal, APL, PL-1

Description: Combines memory, expanded keyboard, gas plasma display, disk drive and printer in a package no larger than most electric typewriters. This 31-lb. microcomputer system interfaces to a variety of outside peripherals, like larger printers or multiple hard disk drives. Also available in applications software packages for business, medical offices, etc.

Price: \$6,980 - \$20,000,  
depending on peripherals

Available: Index  
20775 S. Western Ave.  
Torrance, CA 90501

**Name: ROM Simulator**

System: Apple II Development  
System

Memory: 2K

Hardware: Double-sided board

Description: Double-sided, gold-plated board for developing software from host computer (Apple) to target computer (usually SUPERKIM in Lamar Instruments Development System) to be placed in the ROM. Reduces time required to program. Can be used to increase RAM available in Apple.

Price: \$295.00

Available: Lamar Instruments  
2107 Artesia Blvd.  
Redondo Beach, CA  
90278  
(213) 374-1673

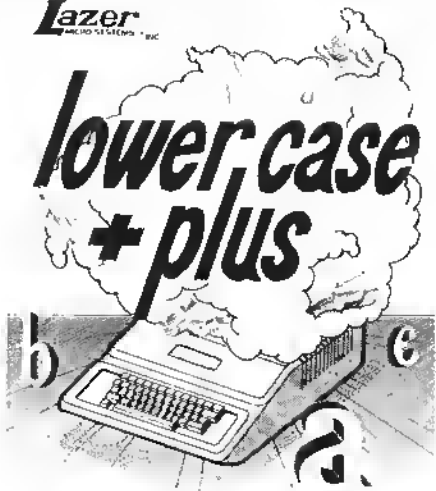
# 16K Apple II, No I/O Slots: \$900.00

Would you even consider purchasing an Apple II that cannot be expanded, even though you would save \$200.00? Of course not! An Apple that can't be expanded is worthless. So why would anyone want to buy a lower case adapter that can't be expanded to meet the changing needs of all Apple owners?

Rather than design our product as one monolithic item that you buy once and pray it doesn't become obsolete, Lazer MicroSystems offers a modular system with power to grow; a complete set of integrated components that can be purchased as needed. You don't need to lay out a large sum of money all at once, nor do you have to pay for unnecessary features to get the features you do want. And you won't have to throw anything away should you decide to upgrade tomorrow. The choice is yours: do you want to take a chance with a system that costs a few dollars less, or do you want to purchase the state-of-the-art system that can be expanded to meet all of tomorrow's needs?

Start with our field-proven Lower Case + Plus. At \$64.95 it offers twice the features found on any other lower case adapter. Software on diskette, inverse-only mode, two on-board character sets (word processing and graphics), excellent documentation, and our exclusive "expansion socket" -- your key to the future. Not all lower case adapters were created equal, ours was created better!

**Lazer**  
MICRO-SYSTEMS, INC.



GRAPHICS & LOWER CASE CHARACTER GENERATOR  
FOR THE APPLE II COMPUTER

Some of the features of our system include:

- 1) Our system is completely compatible with any piece of software that will work with the "Dan Paymar Lower Case Adapter."
- 2) Our system works with every word processor we've seen for the Apple II including EasyWriter and unmodified AppleWriters. In fact, Lazer's lower case system works with more word processors than anyone else's.
- 3) Our hardware works fine with all printers and 80-column boards.
- 4) You CAN order a Lower Case + Plus specifically prepared for your Apple.
- 5) We offer a one-year limited warranty on our board.
- 6) Our board is easily installed. Most beginners can install it within twenty minutes.
- 7) The lower case system is fully transparent to your Apple. The Lazer system does not use up any of the Apple's available RAM, nor does it slow the operation of your computer down in any way. In fact in some instances our equipment speeds up existing programs!
- 8) Lazer MicroSystems' hardware products were designed by Randy Hyde. Randy, as a hardware and software engineer, has been designing products for the Apple II since 1977. With four years of experience behind our products, you can be well assured that Lazer's components are well integrated into the Apple system and you will encounter few difficulties using the Lazer lower case system with any software available for the Apple II.
- 9) Lazer MicroSystems, Inc., is a real live corporation operating out of real offices in Southern California. Most manufacturers of lower case equipment operate out of their bedroom. Who do you think will be around in two years to support their product?

**Lazer**  
MICRO-SYSTEMS, INC.



Next add our Keyboard + Plus. The Keyboard + Plus turns your Apple's uppercase only keyboard into a professional 128-ASCII character keyboard. The Keyboard + Plus also features a 64-byte type-ahead buffer that drastically improves the performance of existing programs. Lazer's buffer can be cleared or disabled if desired.

## MORE PRODUCTS FROM LAZER

**Character Set + Plus:** Add two more ROM-based character sets to your Lower Case + Plus! With the CS + you have a total of four character sets on-board. Choose from any of the 25 fonts provided on the Lower Case + Plus disk, or create your own. Only \$24.95.

**Double Vision + Plus:** At last! Good lower case display for Computer Stop's Double Vision Board. In addition to the improved display, our DV + gives you two on-board character set (std and graphics) as well as our famous expansion socket that lets you add our Character Set + Plus and Graphics + Plus peripherals. Only \$39.95.

**Lower Case + Plus II:** for the budget minded Apple owner. A low-cost chip that replaces the character generator ROM on revision seven and later Apple motherboards. For \$29.95 you get the Lower Case + Plus II, Pascal and BASIC software on diskette, and complete installation instructions. The Lower Case + Plus II is not expandable like our Lower Case + Plus, but we do offer a \$20.00 trade-in allowance if you decide to upgrade to a Lower Case + Plus in the future.

**Lazer**  
MICRO-SYSTEMS, INC.  
1791-G Capital  
Corona, CA 91720  
(714)735-1041

## Ordering Information:

Lazer MicroSystems' products are available from reputable distributors, dealers, and mail order houses worldwide. If your local dealer cannot demonstrate our products for you, tell him he can get them from Computer Data Services, Micro-D, Solis, Lazer MicroSystems, and other distributors. If your dealer refuses to stock Lazer products, give Lazer, Huntington Computing, or Consumer Computers a call--the product is always available off the shelf.

Before you purchase anybody's lower case adapter, ask for a copy of our free booklet "Keyboard Enhancers/Buffers and Lower Case Adapters: From the Inside Out". It will explain all the advantages and disadvantages of installing lower case equipment in your Apple II. Or give us a call--we'd be more than happy to discuss our product line with you.

Dan Paymar Lower Case Adapter TM Dan Paymar.  
Apple...TM Apple Computer Inc.  
Double Vision TM Computer Stop.  
+ Plus TM Lazer MicroSystems.

Note: EasyWriter and unmodified AppleWriter usage requires optional ROM

## 6502 Bibliography: Part XXXIX

### 1114. From the Core (March, 1981)

- Barden, Frank, "Super-Text Patches for the MX-80," pg. 4.  
Combine the best qualities of this word processor with the versatile MX-80 and avoid having the control codes of each interfere with the other.
- Whittaker, Alec, "As BASIC as Possible," pg. 7.  
A short tutorial on fitting some simple routines together.

### 1115. SoftSide 3, No. 6 (March, 1981)

- Patton, Garry J., "Screen Capture," pg. 19.  
A short routine for the Atari (with Apple translation) to print the screen to the printer.
- Voskuil, Jon, "Math Decathlon," pg. 21-25.  
An Applesoft listing of a game/tutorial in four parts.
- Pelczarski, Mark, "Developing Data Base," pg. 34-35, 57.  
Part 7 and the final chapter in this series on a Database for the Apple and Atari.
- Morris, W. and Cope, J., "Flags," pg. 45-46.  
An Atari program to display national flags on the screen.
- Steenon, David, "Strategy Strike," pg. 52-57.  
A game for the Apple II or TRS-80.
- Truckenbrod, Joan, "Three-Dimensional Rotation," pg. 66-67.  
A computer graphics tutorial for 6502 micros.
- Voth, Mitch, "Mini Golf," pg. 68-70.  
A game for the Apple.
- Various "Apple One Liners," pg. 70.  
Several one-line programs for the Apple.
- Johnson, Paul, "Atari Memory Upgrade," pg. 92-93.  
A hardware article on easy 8K to 16K conversion for the CX852 memory module in the Atari 800.

### 1116. 73 Magazine No. 247 (April, 1981)

- Jensen, Carl, "Apples: Five Bits or Eight," pg. 66.  
Ham operation on 5-bit RTTY (Baudot) or 8-bit RTTY (ASCII) with the Apple II; hardware and software.

### 1117. Compute! 3, No. 3, Issue 10 (March, 1981)

- Mansfield, Richard, "Taking the Plunge — Machine Language Programming for Beginners," pg. 20-25.  
A tutorial for PET users.
- DeJong, Marvin L., "Computer Communications Experiment," pg. 28-33.  
Hardware and machine language routine for a 6502-to-RS-232C to Modem interface.
- Sander, Louis F., "Getting the Most from Your PET Cassette Deck," pg. 42-46.  
How to insure the reliability of your cassette for the PET.
- Albrecht, Bob and Firedrake, George, "The Mysterious and Unpredictable RND," pg. 4852.  
Part 3 of several installments for PET users.
- Oakes, Peter, "A CAI Program Called Linear Equation," pg. 54-59.  
A computer assisted instruction (CAI) math program for the PET.

Clarke, Jack, "HEX Conversion," pg. 60-61.

Using the 6502's Decimal Mode — a tutorial.

Ostrowsky, Sherm, "Clearing the Apple II Low-Resolution Graphics Screen," pg. 6266.

Fast screen clear techniques for the Apple.

Mauney, Gene A., "Fun with Apple and Pascal," pg. 68-70.  
Help for the user of Apple/Pascal.

Patchett, Craig, "Designing Your Own Atari Character Sets," pg. 72-77.

A tutorial for Atari users.

Gropper, D.M., "Atari BASIC — A Line Renumbering Utility," pg. 78.

A short program for the Atari.

Baker, Robert W., "Atari Memory Dump and Disassembler," pg. 80-84.

A handy utility program which allows you to examine RAM or ROM memory with either a dump or disassembly listing.

Wrohel, Joseph J., "Formatted Output for Atari BASIC," pg. 84-85.

A utility to simulate 'print using' and TAB functions on the Atari.

Howell, R.A., "Random Color Switching While Idle," pg. 85-86.

A routine for the Atari.

Berger, Tom R., "A Small Operating System: OS65D The Kernel," pg. 87-88.

Part 3 of three installments on an operating system for OSI micros.

Stanford, Charles L., "A Six-Gun Shootout Game for the OSI C1P," pg. 88-91.

A game for the OSI micros.

Brandon, Eric, "Keyprint Revisited," pg. 92-94.

Here is a KEYPRINT routine for 'old ROM' PETs.

Butterfield, Jim, "Learning About Garbage Collection," pg. 96-100.

Reclaiming memory on the PET.

Fremont, David Malmberg, "PET Machine Language Graphics," pg. 102-110.

A tutorial on PET graphics.

Campbell, Gordon, "PET Exec Hello," pg. 124-128.

A trilogy of small programs which allows you to use a 'Hello' file on disk.

Busdiecker, Roy, "Universal Tape Append for PET/CBM," pg. 132-137.

How to combine programs on CBM systems.

Clements, William C., Jr., "A Vocal Hex Dump for the KIM-1," pg. 146-149.

A program for the KIM-1 and an inexpensive speech synthesis unit.

Chamberlin, Hal, "Expanding the KIM-Style 6502 Single Board Computers: The Modified KIM Bus," pg. 150.

Part 3 of three articles on a modified bus.

### 1118. Interface Age 6, Issue 4 (April, 1981)

Moore, Herb, "Sounds of the Atari — In BASIC," pg. 50-54.

Part 2 on color graphics for the Atari.

## NIKROM TECHNICAL PRODUCTS PRESENTS A DIAGNOSTIC PACKAGE FOR THE APPLE II AND APPLE II + COMPUTER.

### "THE BRAIN SURGEON"

Apple Computer Co. has provided you with the best equipment available to date. The Diagnostic Package was designed to check every major area of your computer, detect errors, and report any malfunctions. **The Brain Surgeon** will put your system through exhaustive, thorough procedures, testing and reporting all findings.

#### The Tests Include:

- MEMORY BOARD ROM TEST
- EPROMS FROM CARD TEST
- INTEGER ROM CARD TEST
- MEMORY BOARD RAM TESTS
- DISK DRIVE SPEED CALIBRATION
- DISK DRIVE MAINTENANCE
- DC VOLTAGE MICROMODE M II TEST (HARDWARE & EPROM)
- MONITOR & MODULATOR ROUTINES
- MONITOR SKEWING TESTS
- MONITOR TEST RETURN
- MONITOR TEXT REG TEST
- MONITOR & TV YOKE ALIGNMENT
- 10-RES COLOR TESTS
- 10-RES COLOR TESTS
- RANDOM NOISE GENERATOR
- SKEWER FUNCTION TESTS
- SQUARE WAVE MODULATION
- RADIO & SPEAKER TEST
- RECORD & BUTTON TEST
- PROBE SENSITIVITY
- INTERNAL MAINTENANCE
- GENERAL MAINTENANCE
- ON BOARD "HEIR"

**NEW!**

**The Brain Surgeon** allows you to be confident of your system. This is as critical as the operating system itself. You must depend on your computer 100% of its running time. **The Brain Surgeon** will monitor and help maintain absolute peak performance.

Supplied on diskette with complete documentation and maintenance guide.

PRICE \$40.95  
REQUIRES 48K, EPROM, ROM  
1 Disk Drive, DOS 3.2 or 3.3

**Nikrom Technical Products**  
25 PROSPECT STREET • BEDFORD, MA 01453

#### Call Toll-Free Now!

Master Charge & VISA users call: 1-800-835-2245  
Kassas Residents call: 1-800-362-2721

Dealer Inquiry Invited



#### DISKETTE UPDATE

IF SERIAL NUMBER IS BELOW 20000 OR DETECTED  
BEFORE DISKETTE RETURN DISKETTE PLUS \$1.00  
U.S. \$9.00 FOREIGN

## VIGIL FOR THE PET/CBM

VIGIL is exciting, new interactive language for your PET/CBM. It's easy to learn and lets you quickly create games and graphics applications.

- More than 50 powerful commands for manipulating graphics features
- Double density graphics give you 80 x 50 plot positions
- Large number displays, two timers and tone (with ext. speaker)
- Loading and saving of VIGIL programs to cassette or diskette
- Nine complete programs included: Breakout, Spacewar, Endlessville, U.F.O., SpaceBelle, Concentration, Maze, Asteroids, and Endlessville.
- Comprehensive 50+ page manual
- For DIO, MEW or E.O. Poms



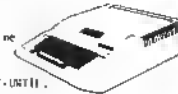
	U.S. & CANADA	FOREIGN
VIGIL for PET/CBM on cassette or diskette w/9 programs.....	135	140
VIGIL User's Manual (refundable with software order).....	115	112
VIGIL Interpreter (16000 assembler language).....	125	130
PET MACHINE LANGUAGE GUIDE (DIO, MEW, or E.O. POMS).....	19	111

### PET & APPLE II USERS TINY PASCAL

The TINY Pascal System turns your PET or APPLE II into a P-machine with:

- LINE EDITOR - free-line, modifies and maintains source language
- COMPILER - produces R-code, the assembly language of the P-machine
- INTERPRETER - executes compiled R-code. Features built-in FREE.
- STRUCTURED PROGRAMMING - CASE-OF, WHILE-DO, IF-THEN-ELSE, REPEAT-UNTIL, FOR-TO/DOWN-TO, BEGIN-END, PROC, FUNC.
- Graphics version has more - GRAPHICS, PLOT, POINT, LINE, IMAGE, EPS, SOR. PLOT/COPY has double density plotting and PLOT II has 100% and 100%.

Plus +  
GRAPHICS



	U.S. & CANADA	FOREIGN
TINY Pascal PLUS+ GRAPHICS VERSION includes manual.....	135	140
PET 32K NEW/E.O. POMS diskette.....	150	160
PET 32K NEW/E.O. POMS cassette.....	155	165
APPLE II 48K and DOS 3.2/3.3.....	150	160
TINY Pascal PLUS+ GRAPHICS VERSION includes manual.....	135	140
PET 16K/32K NEW POMS diskette.....	140	150
PET 16K/32K NEW POMS cassette.....	145	155
APPLE II 32K and DOS 3.2/3.3.....	140	150
TINY Pascal User's Manual (refundable with software order).....	110	112
TINY Pascal 6502 Interpreter (16000 assembler language).....	125	130
TINY Pascal 6502 Interpreter (16000 assembler language).....	125	130
PET MACHINE LANGUAGE GUIDE (DIO, MEW, or E.O. POMS).....	19	111



**ABACUS SOFTWARE**  
P. O. Box 7211  
Grand Rapids, Michigan 49510  
**616 / 241-5510**

Prices include postage.  
DIO, MEW, must be prepaid via  
check, money order or bank  
card. Foreign orders may be  
paid for via international  
money order or bank card.  
(for Europe, Africa, Brazil, etc.)

Edelson, Roger H., "The Microsoft Z-80 SoftCard — CP/M for AP," pg. 60-63.

A review of a card to expand the capabilities of the Apple.

### 1119. Interactive Issue 4 (March, 1981)

Caldwell, Sam, "Communications for the Handicapped," pg. 3-7.

Use of the AIM 65 with some minimal hardware and a simple basic program to assist the non-verbal handicapped.

McIntosh, Bruce, "Assembly Offset," pg. 10-11.

How to make the AIM 65 assembler offset object code for EPROMS.

April, Georges, Emile, "AIM 65 Assembler OUTPUT Formatter," pg. 12-13.

Output formatter and Centronics printer driver.

Corder, Mike, "Solid Graph Plot," pg. 17-20.

BASIC program and machine code for an AIM 65 plot routine.

Shafer, Marvin D., "Improved Plot Routine," pg. 21-22.  
A utility for the AIM 65.

April, Georges, Emile, "AIM 65 Monitor Bit Patterns," pg. 24.

A table of use to AIM 65 users.

### 1120. PEEK (65) 2, No. 3 (March, 1981)

Jones, David A., "Cassette Corner," pg. 4-5.

A cassette loader with checksum which is quite a bit shorter than the OSI autoloader.

Morris, E.D., Jr., "Improve Your Garbage Collection," pg. 6-7.

Memory recovery for the OSI system; a permanent hardware solution to the problem.

Holt, Ken, "Assembler Programmer's Guide to OSI Board Interfacing," pg. 12, 9-11.

\$30 board addressing, OSI 470 board, 470 board addressing, OSI 500 board, 500 board addressing, OSI 510 board, 510 board addressing.

### 1121. KB Microcomputing 5, No. 4, Issue 52 (April, 1981)

Baker, Robert W., "PET-Pourri," pg. 10-13.

News on the VIC-20 Commodore color computer, new PET software, etc.

Messent, Andrew N., "Save It with CASSY," pg. 38-41.

A versatile machine-language program for the OSI CIP which saves any area of memory to the cassette recorder.

Jones, Edward C., "Energize Those OSI Peripheral Ports," pg. 80-82.

Hardware modification for the Challenger 1P or OSI Superboard II to provide for a printer or modem.

Peterson, Craig, "Apple Sector Counter Extraordinaire," pg. 113-114.

An Apple utility to keep track of the free, unused sectors on the floppy disk.

Blank, Jerry, "Hidden Features Exposed," pg. 156-157.

Some unexpected capabilities of the Atari microcomputers, including a hardware mod for upgrading the Atari 400 to 16K.

Bradshaw, Cyril, "OSI Clear-Screen Command," pg. 172-173.

A disk modification which blanks the OSI screen in milli-seconds.

Hansen, Jim, "A Tale of Two Screen Dumps," pg. 174-176.

A utility for the Apple/Paper Tiger combination.

**1122. The Cider Press (January/February, 1981)**

Staff, "The Best of Cider Press, 1980."

Over 100 pages of the best articles published in the Cider Press in 1980.

**1123. L.A.U.G.H.S. 3, No. 3 (March, 1981)**

Roe, David, "There is a Better Way — Machine Language Portion," pg. 3-4.

Routines to locate screen array, store or display Hi-Res screen in that array, and to switch graphics on or off in the Apple.

**1124. The Apple-Dillo (March, 1981)**

Teas, George, "Pascal Primer," pg. 6-7.

Notes on creating a UNIT and including it in the SYSTEM.LIBRARY.

**1125. The Cider Press (March, 1981)**

Hartley, Tim, "Changing Diskette Colume Numbers," pg. 4.

An aid for Apple disk users.

Norris, Paul, "Pascal and the F8 Monitor ROM," pg. 11.

Tips for the Apple Pascal user on accessing certain Apple ROM functions.

Sugou, Shin'Ichirou, "Pascal Assembly — An Example Program."

Utility routines for Apple Pascal users.

**1126. Byte 6, No. 4 (April, 1981)**

Minton, R.B., "A Graphic Execution Display," pg. 34.  
A program for the OSI Superboard to display graphically how fast a program is running.

Carlson, Edward H., "Challenger Writes on Comprint," pg. 310-312.

A 6502 assembly language program that interfaces a 6522 VIA parallel port on the OSI Challenger II with a COMPRINT 912 printer.

**1127. IEEE Transactions On Education, Vol. E-24, No. 1 (February, 1981)**

Hanson, Donald F., "A Microprocessor Laboratory for Electrical Engineering Seniors," pg. 8-14.

Instructional Apparatus including the AIM 65 micro-computer and an auxilliary educational interfacing unit is described.

**1128. Proc, 1981 Southeastern Section Annual Meeting, Amer. Soc. for Eng. Education, (April 5-7, 1981)**

Hanson, Donald F., "A Microprocessor Laboratory Course Based on an AIM 65 Solderless Interfacing Unit," pg. 1-7.

A 6502-based educational tool for Electrical Engineering students.

**1129. Sym-Physis 2, No. 1, Issue 7 (Jan/Feb/Mar, 1981)**

Anon., "A Bell for the KTM-2 and/or KTM-2/80," pg. 4.  
A bell function for the SYM-1.

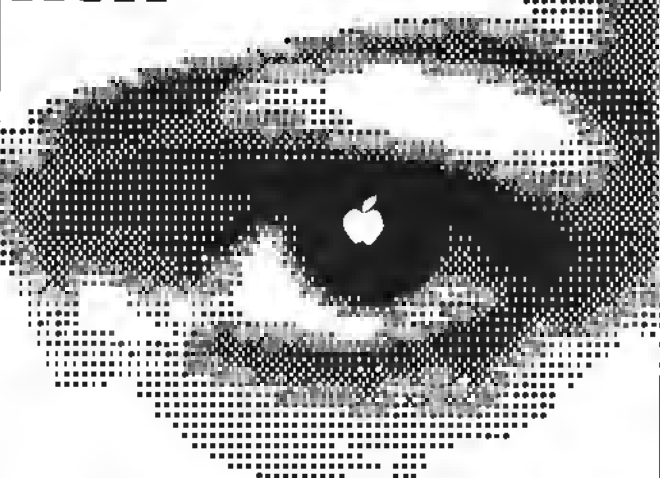
Anon., "Misc notes for SYM-1," pg. 4-6.

Controlling I/O from BASIC; cassette problem and fix; wiggle your chips and flex your boards; the RAE user function; disk systems, etc.

Anon., "A Deductive Story — Part I."

All about BASIC and BAS-1 for the SYM-1.

# Ditherizer II™



## ...the eye of your apple.®

Though it is very simple to use, the Ditherizer II represents the ultimate in video digitizing using the Apple II computer. The Ditherizer is an interface card which converts video input into digitized images. Because the Ditherizer II is a frame grabber, DMA type digitizer, it offers extreme high speed in the conversion process (it grabs an entire frame in 1/60th of a second). The camera supplied with the package is the Sanyo model VC1610X. Cabling is supplied for this camera so as to have the Ditherizer II system up and running in minutes. The video camera used for input must have external sync to allow for the frame grabber technology employed for digitizing. If a camera other than the model recommended is used, wiring adaptations by the user may be required. Software is supplied with the board to allow you to display up to 64 pseudo grey levels on your Apple's screen. The number of grey levels may be changed with one keystroke. The intensity and contrast of the image are controllable via game paddles. Also supplied is software for image contouring for those interested in movement detection or graphic design applications.

The Ditherizer II package is available ready to run with camera, interface card and the software described above for only:

**\$650.00**

Ditherizer II interface card and software (without camera):

**\$300.00**

**Computer Station**  
11610 Page Service Dr.  
St. Louis, MO 63141  
(314) 432-7019

Apple II is a registered trademark of Apple Computer, Inc.  
Ditherizer II is a trademark of Computer Station, Inc.





# SBCS PUTS YOU ON TOP

Organize your business with  
accounting software from SBCS:

- General Ledger
- Accounts Receivable
- Accounts Payable

The above programs can be used alone or integrated. They include extensive error checking and data entry prompting, numerous reports, departmentalizing, and budgeting. Detailed documentation included.

Get on top of things! Call or write today.

**SMALL BUSINESS COMPUTER SYSTEMS**  
4140 Greenwood, Lincoln, NE 68504 (402) 467-1878

## Decision Systems

Decision Systems  
P.O. Box 13006  
Denton, TX 76203

### SOFTWARE FOR THE APPLE II\*

**ISAM-DS** is an integrated set of Applesoft routines that gives indexed file capabilities to your **BASIC** programs. Retrieve by key, partial key or sequentially. Space from deleted records is automatically reused. Capabilities and performance that match products costing twice as much.  
\$50 Disk, Applesoft.

**PBASIC-DS** is a sophisticated preprocessor for structured **BASIC**. Use advanced logic constructs such as **IF...ELSE...**, **CASE**, **SELECT**, and many more. Develop programs for Integer or Applesoft. Enjoy the power of structured logic at a fraction of the cost of **PASCAL**.  
\$35 Disk, Applesoft (48K, ROM or Language Card).

**DSA-DS** is a dis-assembler for 6502 code. Now you can easily dis-assemble any machine language program for the Apple and use the dis-assembled code directly as input to your assembler. Dis-assembles instructions and data. Produces code compatible with the S-C Assembler (version 4.0), Apple's Toolkit assembler and others.  
\$25 Disk, Applesoft (132K, ROM or Language Card).

**FORM-DS** is a complete system for the definition of input and output forms. **FORM-DS** supplies the automatic checking of numeric input for acceptable range of values, automatic formatting of numeric output, and many more features.  
\$25 Disk, Applesoft (132K, ROM or Language Card).

**UTIL-DS** is a set of routines for use with Applesoft to format numeric output, selectively clear variables **CLEAR** gas everything!, improve error handling, and interface machine language with Applesoft programs. Includes a special load routine for placing machine language routines underneath Applesoft programs.  
\$25 Disk, Applesoft.

**SPEED-DS** is a routine to modify the statement linkage in an Applesoft program to speed its execution. Improvements of 5-20% are common. As a bonus, **SPEED-DS** includes machine language routines to speed string handling and reduce the need for garbage clean-up. Author: Lee Meador.  
\$15 Disk, Applesoft (132K, ROM or Language Card).

(Add \$4.00 for Foreign Mail)

\*Apple II is a registered trademark of the Apple Computer Co.

Newman, John, "A Kansas City Standard Tape Dump," pg. 9-16.

A utility for the SYM-1.

Anon., "A Wide Screen Hex/ASCII Memory Dump," pg. 22-25.

An easily relocatable memory dump utility for the SYM-1.

#### 1130. SoftSide 3, No. 4 (January, 1981)

Pelczarski, Mark, "Developing Data Base — Part Five," pg. 16-18.

More on the search routine for this utility for the Atari, the Apple II and the TRS-80.

Edmunds, William, "Computer Space," pg. 40-41.

A game for the Apple.

Morris, William, "Fugue," pg. 74-76.

A music program for the Atari.

Truckenbrod, Joan, "Computer Graphics," pg. 83-84.

Tutorial with demo example for Apple Hi-Res.

#### 1131. Abacus II 3, Issue 2 (February, 1981)

Freeman, Larry, "DOS Type," pg. 2-5.

A routine to identify the type of DOS and disk type active in your Apple.

Zirak, Victor, "ASCII Memory Dump," pg. 8.

View the contents of the Apple's RAM memory with this routine.

Davis, James P., "M.E.C.A. — An Expanded Menu," pg. 9.

A menu program for the Apple disk.

Yee, David R., "Long Division," pg. 16.

An extended precision long division routine for the Apple.

#### 1132. The G.R.A.P.E. Vine 2, No. 2 (March, 1981)

Lawson, Steve, "G.R.A.P.E. Font Converter," pg. 7.

A program for the Apple to convert a standard size font into a large size font.

Ude, Art, "Conversion of Biblical Measures," pg. 8-9.

Cubits to metric units.

#### 1133. Stems from A.P.P.L.E. 4, Issue 3 (March, 1981)

Wittke, Walton L., "Look," pg. 4.

An Applewriter utility that lists the catalog and lists the first 12 lines of a designated text file.

Ward, Dennis, "DOS 3.3 Tool Kit Assembler Hints," pg. 7.

How to get the most out of the Tool Kit assembler on the Apple.

Ward, Dennis, "Professional Hi-Res Made Easy," pg. 7.  
Some hints for using the Tool Kit to modify an Apple graphics page.

#### 1134. The Michigan Apple-Gram 3, No. 3 (March, 1981)

Anon., "Apple II Mini-Assembler F666G," pg. 12-13.

A short tutorial on the Apple monitor's mini-assembler.

Anon., "IAC Apnote: Tabbing with Apple Peripherals," pg. 13-14.

This driver allows the user to tab normally without substituting POKE 36,X for TAB(x).

Zager, Bill, "Apple Concordance Revisited," pg. 27-28.  
An Apple utility to print out a list of a BASIC program's variables.

**1135. The Harvest 2, No. 8 (April, 1981)**

Andersen, Chuck, "Diskette Nibbling," pg. 11-12.

A tutorial on how data is stored on the Apple disk.

Thompson, C.J., "NIFFUM — A DOS 3.3 to 3.2 Converter," pg. 19-20.

A utility for the Apple disk system.

**1136. Washington Apple Pi 3, No. 3 (March, 1981)**

Neuman, David, "CP/M for the Apple," pg. 10-16.

A general description of the CP/M for Apple.

Decker, R.J., "More Tips of the MX-80," pg. 22.

Notes on horizontal tabbing on the Epson MX-80 printer.

**1137. Personal Computing 5, No. 4 (April, 1981)**

Gilder, Jules H., "How to Boot Binary Programs," pg. 56-57.

Use a binary program as your Apple disk Hello.

**1138. Creative Computing 7, No. 4 (April, 1981)**

Parr, James, "Apple as Time-Sharing User," pg. 60-65.

A helping hand into the world of time-sharing for Apple users.

Jacobs, Jake, "Landing Simulator," pg. 156-166.

Using the Apple as a landing simulator for aircraft.

**1139. Radio Electronics 52, No. 5 (May, 1981)**

Hyypia, Jorma, "Learning about Microprocessors," pg. 45-48.

Discussion of the SYM-I as a learning aid.

Gupton, James A., Jr., "Computer Control for the Unicorn-1 Robot," pg. 53-55.

The use of the KIM-1 and SYM-I for robot control is discussed.

**1140. MICRO, No. 35 (April, 1981)**

Rhodes, Ned W., "S-C Assembler Modifications," pg. 7-10.

Adding back the multiply routine; automatic line numbering; etc.

Kovacs, Bob, "Memsearch for the AIM 65," pg. 17-20.

A machine language routine which can scan memory for a user-specified sequence. Includes a wild-card feature.

Orton, Ralph, "SYM Time-Remaining Timer," pg. 37-39.

This SYM program measures elapsed time and sounds an alarm.

Campbell, Gordon A., "Oh No — It's Garbage Collect!," pg. 43.

All about garbage collection (memory management) on the 6502 and how to avoid those long delays.

Sogge, Glenn R., "Integer BASIC Internals," pg. 65-66.

A sorted list of Apple Integer BASIC memory locations and routines.

**1141. AppleGram 3, No. 3 (March, 1981)**

Sander-Cederlof, Bob, "Cryptogram Solver," pg. 8-10.

A short routine for the Apple to help with decoding those cryptograms in the Sunday paper.

Wigginton, Randy, "Fast Garbage Collection," pg. 21-25.

A rapid garbage collector program which reconstructs string memory, rapidly cutting down the length of those times when your Apple program just seems to die.

Sander-Cederlof, Bob, "Modify DOS Commands," pg. 29-30.

A utility for the Apple which changes the DOS commands and updates the DOS on your disk.



## A Wooden Computer?

### Not from Commodore!

So why should the desk look like wood? A pleasant cream and charcoal trimmed desk looks so much better with Commodore systems. One look and you'll see. Interlink desks are right. By design.

### The specifications only confirm the obvious:

- Cream and charcoal color beautifully matches the Commodore hardware and blends with your decor.
- An ideal 710 mm (28") keyboard height yet no bumping knees because a clever cutout recesses the computer into the desk-top.
- High pressure laminate on both sides of a solid core for lasting beauty and strength.
- Electrostatically applied baked enamel finish on welded steel legs—no cheap lacquer job here.
- T-molding and rounded corners make a handsome finish on a durable edge that won't chip.
- Knocked down for safe, inexpensive shipment.
- Patented slip joints for quick easy assembly.
- Levelling glides for uneven floors.
- Room enough for a Commodore printer on the desk, yet fits into nearly any den or office niche—H: 660 mm (26") W: 1170 mm (46") D: 660 mm (26").
- Matching printer stand available with slot for bottom feeding.

**PRICE: \$299**

In short, as Commodore dealers, we won't settle for anything that looks good only in the catalog! Our customers won't let us. They don't buy pictures. And neither should you. This is why we will let you use one of our desks for a week and then decide. If for any reason you don't like it, just return it in good condition for a cheerful refund.

If your Commodore dealer doesn't carry our desks yet, send a check for \$299 and we will ship your desk freight paid!

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ St \_\_\_\_\_ Zip \_\_\_\_\_

Interlink, Inc., Box 134, Berrien Springs, MI 49103  
Master Charge and Visa welcome. Call our order line:  
616-473-3103



**CRAE 2.0** — A fast co-resident Applesoft Editor for Applesoft Programmers. Now perform global changes & finds to anything in your Applesoft program. Quote (copy) a range of lines from one part of your program to another. A fully optimized stop-list command that lists your program to the screen with no spaces added and forty columns wide. Append Applesoft programs on disk to program in memory. Formatted memory dump to aid debugging. Powerful renumber is five times faster than most available renumber routines. Auto line numbering. Crae need be loaded only once and changes your Applesoft program right in memory. 48K APPLE II or PLUS & Applesoft Rom & Disk.

**CRAE on disk with 20 page manual** **\$39.95**

**MCAT 2.0** — MCAT 2.0 is a fast binary utility which creates a sorted master catalog which is saved on disk as a binary file (Fest). The master catalog can be easily updated a whole diskette at a time (Add, Delete, Replace). List/Print have global search capability and one or two columns. Provisions for duplicate volume numbers. Approximately 1200 file names.. 48K or 32K, 13 or 16 sectors DOS supported.

**MCAT on disk with 10 page manual** **\$24.95**

**CRAE and MCAT on one disk** **\$59.95 with manuals**

**EROM #1** — Requires Applesoft ROM & ROMPLUS. CRAE'S powerful Global change/find, optimizes List Command. Hex to Decimal and Decimal to Hex conversion now available on a 2716 EPROM.

**EROM #1 with manual** **\$49.95**

**EROM #2** — (Requires Applesoft ROM and Romplus) CRAE'S Autoline numbering, formatted memory Dump, Append, Number conversion (Hex/Dec) on one 2716 EPROM.

**EROM #2 with manual** **\$34.95**

**EROM #3** — CRAE'S powerful Renumber and Quote function now on two 2716 EPROMS.

**EROM #3 with manual** **\$34.95**

**EROM 1, 2, 3** **\$99.95**

Note: All Eproms are compatible with P.L.E.

Note: Append only requires 48K and DOS.

**OLDORF'S REVENGE** — OLDORF is a well done and exciting HI-Res game using over 100 HI-Res pictures. OLDORF requires 48K, Applesoft Rom, and Disk. As you explore the caverns and castles (each locale is done in HI-Res) looking for treasure, you must battle the one-eyed, two thumbbed torkie; find the grezzlerlip's sword; visit the snogturgle's palace and get through the domain of the three-nosed ickyup — Plus MORE!

**OLDORF on disk** **\$19.95**

**TARTURIAN** — The TARTURIAN requires 48K RAM Applesoft ROM, and disk. As you explore the 160 rooms (each done in HI-Res) gathering weapons and treasure that will prepare you for the final battle against the TARTURIAN, you will encounter deadly KROLLS, battle the MINOTAUR, decipher the YUMMY YAKKY'S secret, make friends with the TULIE. SWEEP, avoid GHOULS, explore the PILLAR tombs, discover secret passages and more. 5 interlocking programs.

**TARTURIAN on disk** **\$24.95**

**CREATURE VENTURE** — You have just inherited your Uncle Stashback's mansion but first you must rid it of the horrible creatures that have taken it over and find your uncle's buried treasure.

Directing the computer with two word commands such as 'Go North', 'Get Key', 'Look Room', 'Punchout Boogeyman' etc. you will need to explore deep into the mansion to finally find the Stashback fortune.

There are tons of High Resolution graphics plus some clever animation just for fun. Required 48K Ram, Applesoft Rom and disk. All High Resolution characters generated with Higher Graphics II by Robert Clerdy.

**CREATURE VENTURE on disk** **\$24.95**

See Your Local Dealer or Send Checks to

**HIGHLANDS COMPUTER SERVICES**

14422 S.E. 132nd • Renton, WA 98056 • (206) 228-6691

Washington residents add 5.4% sales tax. Applesoft and Apple

are registered trademarks of Apple Computers, Inc.

ROMPLUS is a trademark of Mountain Computers, Inc.

(Dealer inquiries invited) VISA, MasterCard, C.O.D.

#### 1142. The C.I.D.E.R. Press 3, No. 2 (March/April, 1981)

Lingwood, David A., "Word Processor Evaluation Guide," pg. 3-6.

A review of features to look for in selecting a word processor for the Apple.

Greene, Amos, "Catalog Interrupt," pg. 9.

A utility for the Apple which permits listing only a portion of the catalog.

#### 1143. Softalk 1, No. 8 (April, 1981)

Wagner, Roger, "Assembly Lines," pg. 25-28.

The latest installment in this continuing series deals with the various addressing modes for the 6502 micro-processor.

#### 1144. The Michigan Apple-Gram 3, No. 3 (April, 1981)

Tuttleman, Roger, "Text File Reader," pg. 2.

An Apple utility to look at sequential text files.

Zager, Bill, "Printing Mail Power Data on Two-Column Labels," pg. 4-5.

Printing labels two across using the Apple.

#### 1145. Dr. Dobb's Journal 6, Issue 4, No. 54 (April, 1981)

Harris, David C., "Important Features of the PCNET Protocol," pg. 47-52.

A protocol for data communications is being developed so that micros such as the PET and Apple can communicate with most mainframe computers using a universal system.

#### 1146. Call — A.P.P.L.E. 4, No. 3 (March/April, 1981)

Rosing, Mike and McLauren, Keith, "Pascal Internals," pg. 9-21.

A primer in several parts: booting process; I/O routines; Pascal directory; 6502 machine code and p-code; and two appendices on location of machine registers and source code for a disassembler.

Manly, Ken, "Keeping Up to Date," pg. 49-54.

An Apple utility to make EXEC file backups of BASIC programs in development.

Hendel, David, "ROM Mover," pg. 53-54.

An Apple utility for moving the F8 ROM to the D0 socket.

Golding, Val J., "Data Statement Writer," pg. 58.

A utility for the Apple.

Hartley, Tim, "Programs to Modify VTOC (DOS3.3)," pg. 63.

Routines to show tracks 30-34 in use and to show tracks 30-34 as completely free.

#### 1147. Applesauce Vol. 2, No. 3 (January/February, 1981)

Jordan, Tricia, "Easy or Pie," pg. 3-8.

Experiences with two Apple word-processing systems.

Hyde, Randy, "LISA's Internal Structure and Customization," pg. 10-12.

How to modify the LISA assembler so that special purpose functions may be included.

Mazur, Jeff, "Coping with Apple's High Speed Serial Card: Part I," pg. 24.

Adding handshaking to the High Speed card.

#### 1148. The Seed 3, No. 4 (April, 1981)

Wheeler, Steve, "Ted II Modifications," pg. 8-10.

Add four new pseudo-operations to the Ted II Editor/Assembler.

**1149. Apple-Dayton Newsletter 2, No. 4 (April, 1981)**

Fox, Dan, "Flies in the Ointment — Bug Found in Apple Renumber," pg. 8.

A problem to watch for in the renumber routine.

**1150. Southeastern Software Newsletter Issue No. 25 (April, 1981)**

Hartley, Tim, "The Muffin Fix," pg. 7-8.

Modification of VTOC so that Muffin would think that disk tracks 32-34 are in use.

**1151. The Apple Peel 3, No. 4 (April, 1981)**

Hill, Alan G., "Amper-Reader," pg. 7.

A utility for the Apple.

**1152. SoftSide 3, No. 7 (April, 1981)**

Truckenbrod, Joan, "Computer Graphics," pg. 26-28.

Perspective drawing on computers such as the Apple.

Morris, William and Cope, John, "Convoy," pg. 34-39.

A game for the Atari.

Summers, Murray, "Applesoft Chaining," pg. 54-55.

A tutorial for the Apple with 3 demo listings.

Voskuil, Jon, "Math Decathlon," pg. 66-68.

This second article for Apple users adds two more events.

**1153. Compute! 3, No. 4, Issue 11 (April, 1981)**

Thornburg, David D., "The Commodore VIC-20: A First Look," pg. 26-33.

All about the new Commodore color computer.

Butterfield, Jim, "How to be a VIC Expert," pg. 34.

Advice to PET owners and a demo listing for the new VIC.

Keck, Rick, "Basically Useful BASIC," pg. 36.

An ascending/descending sort routine for the 6502 micros.

**MICRO**

Statement of ownership, management, etc., required by the act of Congress of October 23, 1962 of MICRO published monthly at Chelmsford, Massachusetts for November 1981.

The name and address of the publisher is MICRO INK, Inc., 34 Chelmsford Street, Chelmsford, Massachusetts. The Editor/Publisher is Robert M. Tripp of Chelmsford, Massachusetts.

The owner is MICRO INK, Inc., Chelmsford, Massachusetts and the names and addresses of stockholders owning or holding one percent or more of the total amount of stock are: Robert M. Tripp and Donna M. Tripp of Chelmsford, Massachusetts.

The known bondholders, mortgagees and other security holders owning one percent or more of the total amount of bonds, mortgages or other securities are: none.

The average number of copies of each issue of this publication sold or distributed through the mails or otherwise to paid subscribers during the twelve months preceding the date shown above is: 13,360.

I certify that the statements made by me above are correct and complete.

Signed: Robert M. Tripp  
Editor/Publisher

## "INSTANT PASCAL" AIM-65 SYSTEM

Employing "Instant Pascal" (A65-PS) on the AIM-65 requires the use of an expansion board for 4 of the 5 ROM's provided in the set.

EXCER is offering assembled and tested systems with 20K RAM, warranted for 6 months, that use either the BANKER™ Board (MEB3-2A) from Micro Technology Unlimited or the DRAM PLUS™ Board (MEB1-2A) from the Computerist and are totally enclosed within the Enclosure's Group case including the power supply (ENC3A), but excepting the interconnecting cable (CBL1 or CBL3). These systems include the following EXCER Part Numbers:

"INSTANT" SYSTEM I		"INSTANT" SYSTEM III	
P/N: CSA65 · 4PS · 3A/1-2A		P/N: CSA65 · 4PS · 3A/3-2A	
A65-4	\$469	A65-4	\$469
A65-PS	100	A65-PS	100
ENC3A	130	ENC3A	130
— DRAM PLUS™ —		— BANKER™BD. —	
MEB1-2A	325	MEB3-2A	265
CBL1	25	CBL3	25
Total System Cost \$1049		Total System Cost \$989	

Rockwell's recommended system using RM65 boards assembled in the Don-EI large enclosure would cost nearly \$1400 (suggested retail).

Call or write for complete list of AIM-65 Products and Accessories or other Custom AIM-65 Systems.

### NEW PRODUCTS!

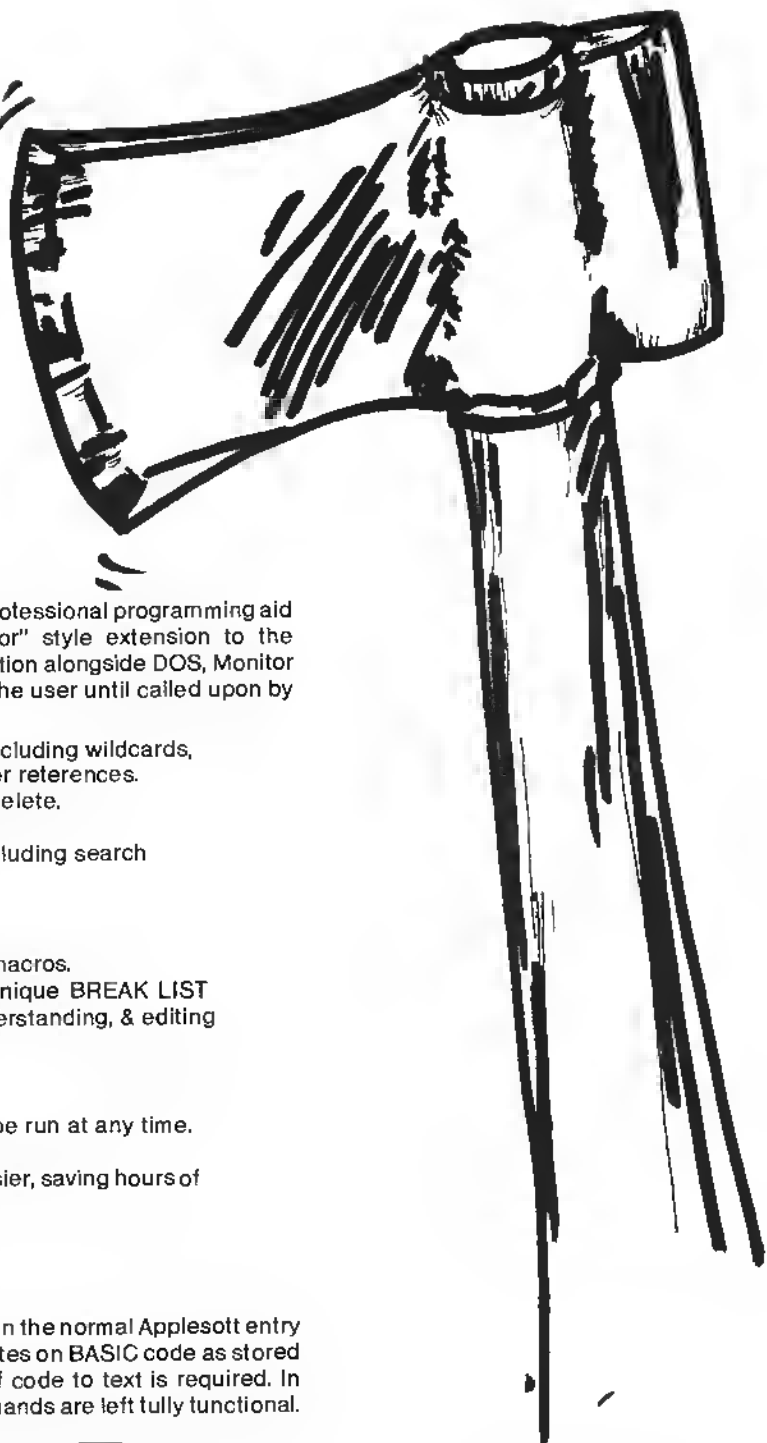
**CUBIT** featuring a 4 1/2 x 6 1/2" AIM-65\* for \$195  
\*less monitor, printer, display & keyboard  
**APPLIED BUSINESS COMPUTER** featuring  
64K RAM Board · \$495  
80 column Video Controller · \$325  
5 1/4" Disk Controller w/ADOSTM · \$485

## Educational Computer Division EXCER INCORPORATED

- SALES
- SERVICE
- INSTALLATION
- CONSULTING

P.O. Box 8600  
White Bear Lake, MN 55110  
(612) 426-4114

# Advanced X-tended Editor



The Advanced X-tended Editor (AXE) is a professional programming aid which provides the user with a "text-editor" style extension to the standard Applesoft\* operation system. Operation alongside DOS, Monitor and Applesoft, AXE remains transparent to the user until called upon by one of over **thirty** commands.

- Global search & replacement, including wildcards, selected changes, & line number references.
- Full character insert, gobble & delete.
- Full statement insert & delete
- Enhanced cursor movement including search ahead & position.
- Two packed list edit modes.
- Recall editing modes.
- User programmable keyboard macros.
- Four LIST formats, including unique BREAK LIST format for easier reading, understanding, & editing of code.
- Auto line-numbering.
- Lower case character entry.
- Resident BASIC program may be run at any time.
- Many more features.
- Develop programs quicker & easier, saving hours of programming cost.
- Requirements:  
Apple II/II+,\* Applesoft,  
DOS 3.3, 48K Ram

Commands are easy, logical, and operate in the normal Applesoft entry mode, or in AXE's editing modes. AXE operates on BASIC code as stored in memory by Applesoft. No conversions of code to text is required. In addition, all Apple II DOS and Monitor commands are left fully functional.

## Advanced X-tended Editor

Available at your local dealer  
An invaluable tool at only \$69.95

\*Apple II/II+, and Applesoft  
are registered trademarks  
of Apple Computer, Inc.



## Versa Computing, Inc.

3541 Old Conejo Road, Suite 104  
Newbury Park, CA. 91320 (805)498-1956

## Advertiser's Index

Aardvark Technical Services.....	52	Micro Business World.....	25
Abacus Software.....	120	Micro Distributors.....	127
Advanced Operating Systems.....	1BC	MICRO INK, Inc.....	54
Adventure International.....	1	Micro Interface.....	29
Andromeda, Inc.....	24, 84	Microsoft Consumer Products.....	IFC, 19
Applied Electronic Components, Inc.....	20	Micro-Ware Distributing, Inc.....	103
Astar International Co.....	44	Mittendorf Engineering.....	51
Aurora Software Associates.....	55	Modular Media.....	105
Beagle Brothers Micro Software.....	62	Modular Systems.....	113
Beta Computer Devices.....	116	Money Disk.....	100
Broderbund Software.....	103	Mountain Computer.....	7
CALL A.P.P.L.E.....	40	Muse Software.....	108
Columbus Instruments.....	65	Nibble.....	66
CompuTech.....	94	Nikrom Technical Products.....	120
Computer Advanced Ideas.....	63	Olympic Sales Co.....	111
Computer Case Co.....	113	Omegasoft.....	100
The Computerist, Inc.....	36	Omega Microware.....	42, 97
Computer Mail Order.....	26	Orion Software.....	62
Computer Station.....	121	Pegasys Systems.....	102
Computer Trader.....	11	Percom Data Co., Inc.....	48
Consumer Computers.....	37	Perry Peripherals.....	50
Datamost.....	4, 6, 94	The Place Where You Go To Buy Computers, Inc.....	30
Data Resources Corp.....	67	Pretzelland Software.....	81
Data Transforms.....	70	Programmer Newsletter.....	116
Decision Systems.....	122	Progressive Computing.....	23
D&N Microproducts, Inc.....	111	Real Soft.....	99
Eastern House Software.....	34	Rehnke Software.....	114
Ed-Sci Development.....	44	Renaissance Technology Corp.....	59
Engineering Micro Software Center.....	114	J. Rosenberg.....	34
Excert, Inc.....	125	Rosen Grandon Associates.....	111
Execom Corp.....	34	Scelbi Publications.....	94
Galfo Systems.....	62	Sensible Software.....	92
Gimix, Inc.....	13	Sirius Software.....	71-78
Headware.....	89	Skyles Electric Works.....	17, 60, 93
Highland Computer Service.....	124	Small Business Computer Systems.....	122
Hogg Laboratory, Inc.....	23	Smoke Signal Broadcasting.....	41
Hudson Digital Electronics.....	18	Soft CTRL Systems.....	47
Huntington Computing.....	BC	Software Sorcery, Inc.....	44
Innovative Design Software, Inc.....	45	Soundustrial Electronics, Inc.....	65
Interlink, Inc.....	123	Southeastern Software.....	33
Jini Micro Systems.....	16	Southwestern Data Systems.....	61
Ken-Way Products.....	116	Stellation Two.....	42
Lazer Micro Systems, Inc.....	12, 118	Sublogic Communications.....	56
LJK Enterprises.....	98	Sunset Electronics.....	55
Logical Software, Inc.....	100	Synergistic Software.....	8, 115
MICRObits (formerly classifieds).....	86, 90, 91, 93	Systems International.....	83
		Versa Computing.....	95, 126
		Wesper Micro Systems.....	2
		Western New York Microcomputer, Inc.....	29

**The only  
thing you can  
do with a  
baked Apple  
is eat it.**

™Apple II is a trademark of Apple Computer, Inc.

The more you stuff your Apple II™ with plug-in boards, the more of a chance it has to overheat. And once that happens, it won't do anybody any good. Your program bombs and you start losing time and money.

The solution? Simple. Take two minutes to install the Dana Industries fan in the back of your Apple, and you'll practically never have to worry about overheating again.

So pick up the Dana Industries fan at your local computer store. And your Apple will have a long and fruitful life.





# Next Month in MICRO

## Pascal Faature

- **Elementary Pascal Internals** — An introduction to the internal structure of the P-machine and to some of the concepts which underlie the workings of P-code Pascal implementations.
- **Pascal Textfile Lister** — This utility will improve the appearance of your listings by separating them into pages with headings.
- **RELOC** — Allows the Apple Pascal text editor to be used with DOS 3.3 to more easily edit BASIC text files.
- **Pascal Tutorial, Part 3** — Last article in our series to help you understand UCSD and Pascal.

## Other Faatures

**Shape Manipulate Program** — This Applesoft program lets you create a shape table, delete shapes, add shapes from other tables, or change the maximum number of shapes in a table.

**Experimentation and the TRS-80C Color Computer** — A summary of the normal capabilities of the TRS-80 Color Computer, and the unit's I/O capability.

**An I/O Expansion for the AIM** — This article describes a method of adding two more V.I.A.'s to the AIM to triple the capacity of its input/output control hardware.

**Scrolling List Program** — Scroll forwards or backwards through a listing to view any part of a BASIC program without requiring a series of keyed LIST commands.

# 40% OFF

**More MICRO for Less Money When  
When You Subscribe, until December 31st**

**Your money goes farther when you subscribe.** During the course of a year, when you subscribe, you save 40% (in the U.S.).

Pay only \$18.00 (\$1.50 a copy) for 12 monthly issues of MICRO sent directly to your home or office in the U.S.

But on the newsstand — if you can locate the issue you want — you pay \$30.00 a year (\$2.50 a copy).

Save 40% **and** make sure you get every issue. Subscribe to MICRO today.

**MICRO**  
34 Chelmsford Street  
P.O. Box 8502  
Chelmsford, MA 01824

Please send me MICRO for ☐ 1 year ☐ 2 years  
NOTE: Airmail subscriptions accepted for 1 year only.

Check enclosed \$ \_\_\_\_\_  
Charge my ☐ VISA account  
☐ Mastercard account

No. \_\_\_\_\_

Expiration date \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City/State \_\_\_\_\_ Zip \_\_\_\_\_

### Subscription Rates Effective January 1, 1982

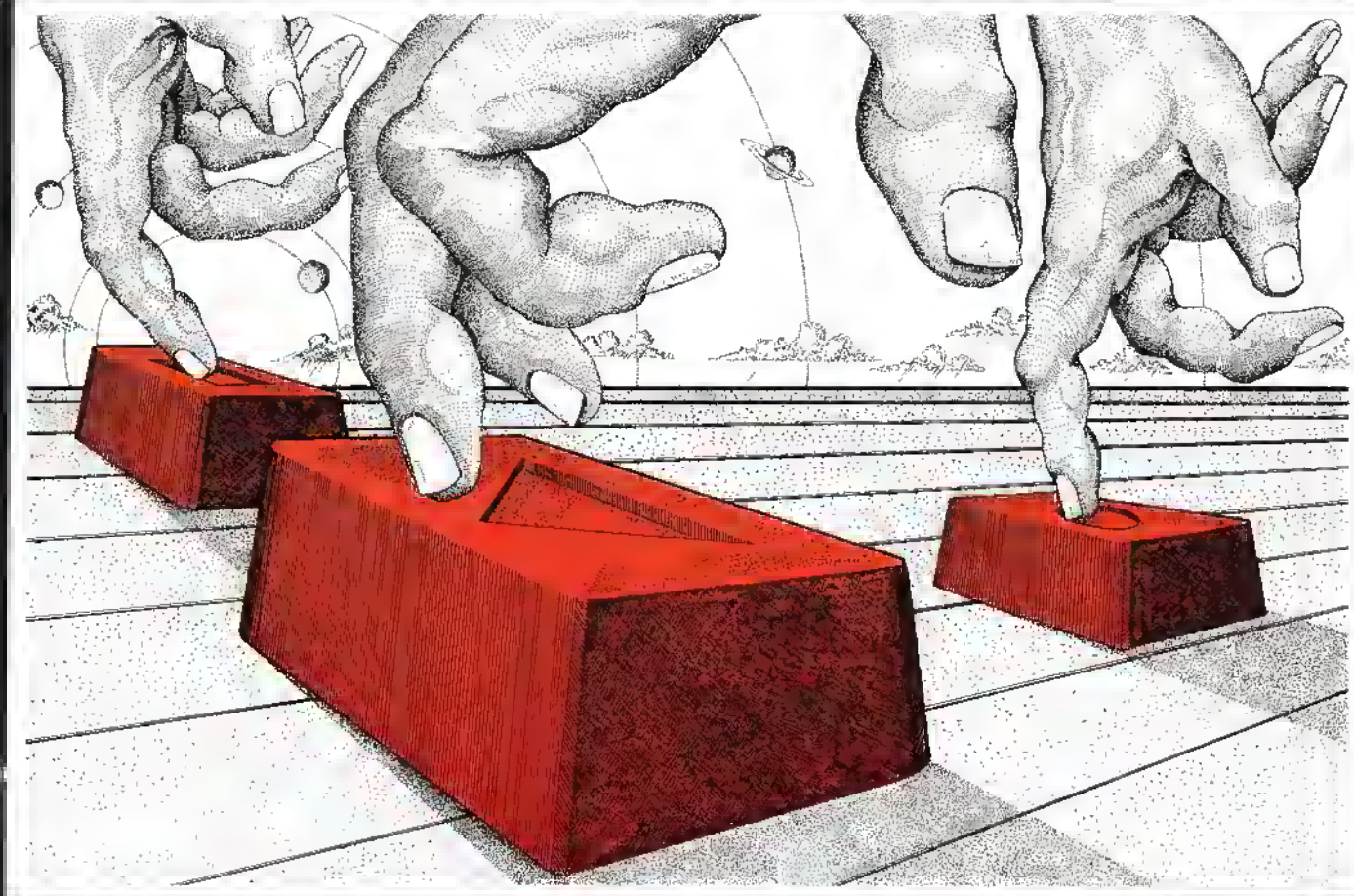
Country	Rate
United States	\$24.00 1 yr. 42.00 2 yr.
Foreign surface mail	27.00
Europe (air)	42.00
Mexico, Central America, Mid East, N. & C. Africa	48.00
South Am., S. Afr., Far East, Australasia, New Zealand	72.00


\* Airmail subscriptions accepted for only 1 year.  
For U.S. and Canadian 2-year rates, multiply by 2.

Job Title: \_\_\_\_\_

Type of Business/Industry: \_\_\_\_\_

# MANUAL DEXTERITY



 The very popular *Mostly Basic* book teaches users introductory programming techniques while providing a myriad of useful applications for the home and business. Advanced Operating Systems has compiled these programs and grouped them into 3 sections. Buy any or all sections as you need them. Each section is available on cassettes for \*TRS-B0 Models I and III, and on diskettes for Apple Computers.

**HOUSEHOLD:** Digital Stopwatch • The House Buying Guide • Amortization Schedule • Electric Energy Usage • Medical Expense Record • Recipe Amount Calculator • The Basic Diet • Message Taker • Gas Mileage

Calculator • The Tarot Card Reader Game.

**EDUCATIONAL:** The Dungeon of Htan • Language Flash Cards • Memory Challenger • Visual Perception Test • Math 4 • The Reading Pacer • Spelling Test.

**SCIENTIFIC:** Basic Telephone Dialer • Combination Lock • The Time Machine • The Word Board • Constellation 10 • The Sun • Digital Dice • Hex to Decimal and Decimal to Hex Conversion.

The *MOSTLY BASIC* series from Advanced Operating Systems is now available at your local software retailer, or call 1-800-348-B55B for the nearest dealer.

## ADVANCED OPERATING SYSTEMS

450 St. John Road  
Michigan City, Ind. 46360  
219 879-4693

# HUNTINGTON COMPUTING

ONE OF THE WORLD'S LARGEST INVENTORIES

VisiCalc List \$200.00 ..... now **\$149.00**

VisiFile List \$250.00 ..... now **\$199.00**

Horriblescope (Disk) List \$15.00 ..... now **\$3.99**

## MISCELLANEOUS

Escape from Acturus	\$29.95	now	<b>\$25.39</b>
Basic Mailer	\$69.95	now	<b>\$59.49</b>
Memory Management II	\$49.95	now	<b>\$42.49</b>
Castle Wolfenstein	\$29.95	now	<b>\$25.39</b>
Upper Reaches of Apshai	\$19.95	now	<b>\$16.89</b>
Bridge Tutor	\$39.95	now	<b>\$25.19</b>
PASCAL Animation Tools			<b>\$45.99</b>
Hand Holding BASIC			<b>\$64.99</b>
UT-100 Emulator			<b>\$45.99</b>
Space Quark	\$29.95	now	<b>\$25.39</b>
Beneath Apple DOS (book)	\$19.95	now	<b>\$14.49</b>
Birth of the Phoenix	\$14.95	now	<b>\$12.49</b>
Goblins	\$27.50	now	<b>\$22.29</b>
Painter Power	\$39.95	now	<b>\$33.89</b>
U.S. Constitution	\$29.95	now	<b>\$25.29</b>
Merger	\$49.95	now	<b>\$42.49</b>
Super Stellar Trek	\$39.95	now	<b>\$33.89</b>
LISA	\$79.95	now	<b>\$67.89</b>
V-Plot (Yuccipal)	\$29.95	now	<b>\$25.39</b>
V-Strat	\$29.95	now	<b>\$25.39</b>
V-Prml	\$29.95	now	<b>\$25.39</b>
Brain Surgeon	\$49.95	now	<b>\$42.49</b>
Info Master	\$150.00	now	<b>\$127.49</b>
Waterloo II	\$49.95	now	<b>\$42.39</b>
Fantasyland 2U41	\$59.95	now	<b>\$50.99</b>
Torpedo Terror	\$24.95	now	<b>\$21.19</b>
Speedslai	\$139.95	now	<b>\$114.69</b>
Kaves of Kaikhan	\$49.95	now	<b>\$42.29</b>
Dos Boss	\$24.00	now	<b>\$20.39</b>
Mamorex Disks		10 for	<b>\$24.99</b>
Verbalim Database-plain w/hubs		10 for	<b>\$27.99</b>
Dysans		10 for	<b>\$49.99</b>
Flipsort Box			<b>\$29.80</b>
Scotch Disk Cleaner	\$29.95	now	<b>\$24.99</b>
Atari II/TRS-80/IIe/IIx			<b>\$24.99</b>

## GAMES

Hi-Res Soccer	\$29.95	now	<b>\$25.29</b>
Apple II/Olds	\$29.95	now	<b>\$25.39</b>
Wurst of Huntington Computing			<b>\$19.99</b>
Gobbler	\$24.95	now	<b>\$21.19</b>
Ultima	\$39.95	now	<b>\$33.89</b>
Autobahn	\$29.95	now	<b>\$25.39</b>
Battle Cruiser Action	\$44.95	now	<b>\$26.89</b>
Gorgon	\$39.95	now	<b>\$33.89</b>
Super Stellar Trek	\$39.95	now	<b>\$33.89</b>
Hellfire Warrior	\$39.95	now	<b>\$33.99</b>
Gamma Goblins	\$29.95	now	<b>\$25.29</b>
Mission Asteroid	\$19.95	now	<b>\$17.99</b>
Wizardry	\$49.95	now	<b>\$42.49</b>
Star Mines	\$29.95	now	<b>\$25.29</b>
Warp Factor	\$39.95	now	<b>\$33.99</b>



## WURST OF HUNTINGTON

Read Softalk's review  
on page 87 of the  
October issue

**\$19.99**

## NEW PROGRAMS

Sneakers	\$29.25	now	<b>\$25.39</b>
Cops & Robbers	\$34.95	now	<b>\$29.49</b>
Poi-O-Gold I	\$39.95	now	<b>\$33.89</b>
Poi-O-Gold II	\$39.95	now	<b>\$33.89</b>
Ring of Saturn	\$39.95	now	<b>\$33.89</b>
Streets of the City & Truckee	\$24.95	now	<b>\$21.19</b>
President Elect	\$39.95	now	<b>\$23.89</b>
Dis-o-Doc	\$72.39	now	<b>\$61.49</b>
Med Fly Mania	\$29.95	now	<b>\$24.29</b>
Hungry Boy	\$24.95	now	<b>\$21.19</b>
Anova	\$74.95	now	<b>\$63.79</b>
Solitaire	\$29.95	now	<b>\$25.39</b>
The Source	\$100.00	now	<b>\$89.99</b>
Race for Midnight	\$29.95	now	<b>\$25.39</b>
Hi-Res Secrets	\$125.00	now	<b>\$104.19</b>
Banners I	\$34.95	now	<b>\$29.49</b>
Complete Graphics (Tablet)	\$119.95	now	<b>\$101.89</b>
Special Effects (Tablet)	\$69.95	now	<b>\$60.79</b>
Inkwell Apple - III	\$150.00	now	<b>\$130.49</b>
Snack Attack	\$29.95	now	<b>\$25.39</b>
V-Plot	\$29.95	now	<b>\$25.39</b>
Disasem/65	\$29.95	now	<b>\$25.39</b>
The Inspector (Disk or Prom)	\$49.95	now	<b>\$42.39</b>
The Book	\$19.95	now	<b>\$11.97</b>
Don I (Book)	\$8.95	now	<b>\$6.65</b>
Using 6502 Assembly Language	\$19.95	now	<b>\$16.89</b>
Expandaport	\$59.95	now	<b>\$50.89</b>
Firebird	\$29.95	now	<b>\$25.39</b>
Thiel	\$29.95	now	<b>\$25.29</b>
Threshold	\$23.97	now	<b>\$20.38</b>
Target Planner	\$195.00	now	<b>\$165.49</b>
Paddle-Apple	\$29.95	now	<b>\$26.89</b>
So Cal Research	\$14.95	now	<b>\$13.45</b>
Word Handler	\$250.00	now	<b>\$212.49</b>

## GAMES

Microsoft Adventure	\$29.95	now	<b>\$25.29</b>
Wizard and the Princess	\$32.95	now	<b>\$26.99</b>
Flight Simulator	\$34.95	now	<b>\$29.49</b>
Odyssey	\$29.95	now	<b>\$25.39</b>
Sargon II	\$34.95	now	<b>\$29.49</b>
Space Eggs	\$29.95	now	<b>\$25.29</b>
Hi-Res Cribbage	\$24.95	now	<b>\$21.19</b>
Lords of Karma (cass.)	\$20.00	now	<b>\$16.99</b>
Oh Shoot		now	<b>\$19.99</b>
ABM	\$24.95	now	<b>\$21.19</b>
Computer Conflict	\$39.95	now	<b>\$35.99</b>
Computer Air Combat	\$59.95	now	<b>\$52.99</b>
Temple of Apshai	\$39.95	now	<b>\$33.89</b>
Zork	\$39.95	now	<b>\$33.99</b>
All Nibble Software		15% off	<b>\$11.11</b>
Robot Wars	\$39.95	now	<b>\$33.99</b>
Cranston Manor	\$34.95	now	<b>\$29.49</b>
Dragon's Eye	\$24.95	now	<b>\$21.19</b>
Computer Acquire	\$20.00	now	<b>\$14.99</b>
Twala's Last Redoubt	\$29.95	now	<b>\$25.39</b>
Alien Rain	\$24.95	now	<b>\$21.19</b>
Alien Typhoon	\$24.95	now	<b>\$21.19</b>
Raster Blaster	\$29.95	now	<b>\$25.39</b>
3-D Sking	\$24.95	now	<b>\$21.19</b>
Creature Venture	\$24.95	now	<b>\$21.19</b>
Galaxy Space War I	\$39.95	now	<b>\$22.99</b>
Meteoroids in Space	\$19.95	now	<b>\$16.99</b>
Dragon Fire	\$49.95	now	<b>\$42.49</b>
Pool 15	\$34.95	now	<b>\$29.49</b>

## BMP Joystick

Here's a joystick you won't want to be without. It's the only joystick we know about that allows you to change the axis with a flip of a switch. Only the highest quality parts are used.

A real bargain at

**\$49.95**

NEC Green Screen Monitor List \$285.00 ..... now **\$199.00**

Zenith Green Screen Monitor List \$159.00 ..... now **\$109.00**

Ulysses List \$34.95 ..... now **\$29.69**

Speed/asm List \$39.95 ..... now **\$33.89**

Lisa 2.5 List \$79.95 ..... now **\$67.89**

Dinosaurs List \$15.00 ..... now **\$12.69**

**Apple®**

ORDER BY PHONE  
800-344-4111 (outside Calif.)  
800-692-4143 (inside Calif.)  
209-992-5411 (foreign or local)

**HUNTINGTON COMPUTING**

Post Office Box 787  
Corcoran, California 93212



We take MasterCard, VISA or American Express (Include card # and expiration date). California residents add 6% tax. Include \$2.00 for postage. Foreign and hardware extra. Send for free catalog. Prices subject to change.

Apple is a registered trademark of Apple Computer, Inc.